



EARLI 2021 ONLINE BOOK OF ABSTRACTS

the 19th Biennial
EARLI
Conference for
Research
on Learning
and Instruction

**EDUCATION AND
CITIZENSHIP:**
Learning and Instruction
and the Shaping of Futures



Policy Makers Panel 1

23 August 2021 09:15 - 10:00

Auditorium A

Policy Makers Panel

Universities for the Future: The Contribution of Research in Learning and Instruction

Keywords: Economics of Education, Educational Policy, Higher Education, Synergies between Learning; Teaching and Research

Interest group:

Chairperson: Debra Myhill, University of Exeter, United Kingdom

The Policy Panel brings together key policy-makers from the world of education with EARLI members in order to discuss and consider a current issue in education. This year, we are looking at how universities will need to change, or indeed might already be changing in a post-pandemic world, challenged by such issues as digital transformations in learning, climate change and education for sustainable development, and equality and diversity in participation.

Universities for the Future: The Contribution of Research in Learning and Instruction

Presenting Author:Sari Lindblom, University of Helsinki, Finland; **Presenting Author:**Ian Dunn, Coventry University, United Kingdom; **Presenting**

Author:Pam Fredman, International Association of Universities, Sweden; **Presenting Author:**Hilligje van t land, International Association of Universities (IAU), France

The Policy Panel brings together key policy-makers from the world of education with EARLI members in order to discuss and consider a current issue in education. This year, we are looking at how universities will need to change, or indeed might already be changing in a post-pandemic world, challenged by such issues as digital transformations in learning, climate change and education for sustainable development, and equality and diversity in participation.

Session A 1

23 August 2021 10:45 - 11:45

Session Room 13

Workshop

Shape your own professional future through guided reflection exercises

Keywords: Higher Education, Reflection, Researcher Education, Teacher Professional Development

Interest group:

In this session, you will be invited to reflect on your own professional goals in order to better craft your career and define next steps. Participants will engage in hands on professional development exercises to identify what their professional impact and scope is and what brings them professional joy. This workshop draws on literatures ranging from educational sciences and cognitive psychology to human resources, and on our personal experiences as scholars and experienced faculty developers in different higher education institutions. Our structured workshop will guide participants to reflect on their own aims and values as contributing members of a larger institutional community. This was perhaps never more important than during the current global pandemic that forced us all to work in relative isolation, retreated to our home offices. Participants will leave with an increased sense of agency over their current job, specific ideas for next steps in their career, and new ideas about how to mentor younger colleagues.

Shape your own professional future through guided reflection exercises

Presenting Author:Christel Lutz, University Utrecht, Netherlands; **Presenting Author:**Merel van Goch, Utrecht University, Netherlands; **Presenting**

Author:Vicki Baker, Albion College, United States

In this session, you will be invited to reflect on your own professional goals in order to better craft your career and define next steps. Participants will engage in hands on professional development exercises to identify what their professional impact and scope is and what brings them professional joy. This workshop draws on literatures ranging from educational sciences and cognitive psychology to human resources, and on our personal experiences as scholars and experienced faculty developers in different higher education institutions. Our structured workshop will guide participants to reflect on their own aims and values as contributing members of a larger institutional community. This was perhaps never more important than during the current global pandemic that forced us all to work in relative isolation, retreated to our home offices. Participants will leave with an increased sense of agency over their current job, specific ideas for next steps in their career, and new ideas about how to mentor younger colleagues.

Session A 2

23 August 2021 10:45 - 11:45

Session Room 3

Workshop

Motivational, Social and Affective Processes

Making Pedagogical and Assessment Decisions that Prioritize Students' Intrinsic Motivation

Keywords: Attitudes and Beliefs, Educational Psychology, Instructional Design, Motivation

Interest group: SIG 08 - Motivation and Emotion

Remote teaching seems to have brought conversations about student motivation to the forefront of many university instructors' minds. Although instructors may currently have heightened awareness of their desire for engaged students, they have likely always desired students who are enthusiastically involved in the course content and related activities and assignments. The typical depiction of post-secondary students being highly pragmatic and grade-focused rendering enthusiasm sometimes in short supply may be further exacerbated by the current remote learning conditions resulting from COVID-19. Achievement motivation provides a lens that is equally applicable in the context of remote learning or regular instruction that can provide concrete suggestions on how instructors can make pedagogical and assessment decisions that support students' intrinsic motivation, engagement, enthusiasm, and learning. This workshop is designed for any instructor interested in helping students (re)embrace their love for learning regardless of the course content, class size, or grading policies. Based on results from two five-year nationally-funded programs of research, the presenter will describe contemporary theorizing on student motivation and related motivation design principles to guide pedagogical and assessment decisions. Next, the presenter will take attendees through a series of learning-by-doing activities designed to (a) clarify their own beliefs about student motivation, (b) tailor course components to maximize students' intrinsic motivation, and (c) challenge the longstanding tendency to motivate students with grades.

Making Pedagogical and Assessment Decisions that Prioritize Students' Intrinsic Motivation

Presenting Author:Lia Daniels, University of Alberta, Canada

Remote teaching seems to have brought conversations about student motivation to the forefront of many university instructors' minds. Although instructors may currently have heightened awareness of their desire for engaged students, they have likely always desired students who are enthusiastically involved in the course content and related activities and assignments. The typical depiction of post-secondary students being highly pragmatic and grade-focused rendering enthusiasm sometimes in short supply may be further exacerbated by the current remote learning conditions resulting from COVID-19. Achievement motivation provides a lens that is equally applicable in the context of remote learning or regular instruction that can provide concrete suggestions on how instructors can make pedagogical and assessment decisions that support students' intrinsic motivation, engagement, enthusiasm, and learning. This workshop is designed for any instructor interested in helping students (re)embrace their love for learning regardless of the course content, class size, or grading policies. Based on results

from two five-year nationally-funded programs of research, the presenter will describe contemporary theorizing on student motivation and related motivation design principles to guide pedagogical and assessment decisions. Next, the presenter will take attendees through a series of learning-by-doing activities designed to (a) clarify their own beliefs about student motivation, (b) tailor course components to maximize students' intrinsic motivation, and (c) challenge the longstanding tendency to motivate students with grades.

Session A 3

23 August 2021 10:45 - 11:45

Session Room 12

Workshop

How to deal with non-significant p-values and make them informative: equivalence testing

Keywords: Doctoral Education, Misconceptions, Quantitative Methods, Researcher Education

Interest group: SIG 17 - Methods in Learning Research

Reviews of educational research have shown that non-significant *p*-values are frequently misinterpreted as indicating evidence for the absence of an effect, or as indicating evidence for the difference to another effect which has turned out significant. In addition, non-significant *p*-values can tempt researchers to conduct further analyses and report only those providing significance, which biases the evidential value of individual and collective *p*-values. In this workshop, we start with explanations and simulations which we conduct and interpret together in the free R software environment that will show us what a non-significant *p*-value really indicates, and what not. Based on these insights, we will discuss and practice the application of equivalence testing, a simple technique that can help us find out what a non-significant *p*-value really indicates. With this approach one can differentiate whether a non-significant *p*-value really indicates evidence for the absence (or negligible size) of an effect, or whether the evidence is inconclusive. In another task we will practice how we can determine a smallest effect size of interest, which is required for such approaches. Participants should bring a mobile device with the R software environment and the following packages installed: *psych*; *DescTools*; *TOSTER*; *learnr* and *ggplot2**. Whereas prior knowledge in using R is not a requirement, participants should be familiar with basic terms of frequentist statistics such as variance, standard deviation, *t*-test and null-hypothesis.**In case you experience problems installing these packages drop us an e-mail before the workshop.*

How to deal with non-significant p-values and make them informative: equivalence testing

Presenting Author: Christian Thurn, ETH Zurich, Switzerland; **Co-Author:** Peter Edelsbrunner, ETH Zurich, Switzerland

Reviews of educational research have shown that non-significant *p*-values are frequently misinterpreted as indicating evidence for the absence of an effect, or as indicating evidence for the difference to another effect which has turned out significant. In addition, non-significant *p*-values can tempt researchers to conduct further analyses and report only those providing significance, which biases the evidential value of individual and collective *p*-values. In this workshop, we start with explanations and simulations which we conduct and interpret together in the free R software environment that will show us what a non-significant *p*-value really indicates, and what not. Based on these insights, we will discuss and practice the application of equivalence testing, a simple technique that can help us find out what a non-significant *p*-value really indicates. With this approach one can differentiate whether a non-significant *p*-value really indicates evidence for the absence (or negligible size) of an effect, or whether the evidence is inconclusive. In another task we will practice how we can determine a smallest effect size of interest, which is required for such approaches. Participants should bring a mobile device with the R software environment and the following packages installed: *psych*; *DescTools*; *TOSTER*; *learnr* and *ggplot2**. Whereas prior knowledge in using R is not a requirement, participants should be familiar with basic terms of frequentist statistics such as variance, standard deviation, *t*-test and null-hypothesis.**In case you experience problems installing these packages drop us an e-mail before the workshop.*

Session A 4

23 August 2021 10:45 - 11:45

Session Room 8

Espresso Paper

Assessment and Evaluation, Higher Education, Learning and Special Education

Higher Education

Keywords: Assessment Methods and Tools, Case Studies, E-Learning/Online Learning, Emotion and Affect, Environmental Education, Higher Education, Instructional Design, Learning and Developmental Difficulties, Qualitative Methods, Quantitative Methods, Reading Comprehension, Reflection, Researcher Education, Special Education, Synergies between Learning; Teaching and Research, Teaching/Instruction

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education, SIG 15 - Special Educational Needs, SIG 24 - Researcher Education and Careers

Chairperson: Rachel Shanks, University of Aberdeen, United Kingdom

Programmatic assessment in seven different domains in higher professional education

Keywords: Assessment Methods and Tools, Case Studies, Higher Education, Qualitative Methods

Presenting Author: Liesbeth Baartman, Utrecht University of Applied Sciences, Netherlands; **Co-Author:** Tamara van Schilt-Mol, Hogeschool van Arnhem en Nijmegen, Netherlands; **Co-Author:** Cees van der Vleuten, Maastricht University, Netherlands

In programmatic assessment, an arrangement of different assessment methods is deliberately designed across the entire curriculum, combined and planned to support both robust (summative) decision-making and (formative) student learning. Evidence of the value of programmatic assessment is emerging, but strongly focuses on the medical domain. In this study, we focused on programmatic assessment in bachelor/master courses outside the medical domain. Interviews were conducted with teachers/curriculum designers of seven different courses. We focused on: (1) reasons to implement programmatic assessment, (2) the design and implementation process, (3) characteristics of curriculum/assessment, and (4) teacher and student experiences. Within case and cross case analysis showed similarities and differences. For all cases, programmatic assessment was not the starting point, but fitted views on what is important in learning and work. The theoretical principles of programmatic assessment resulted in different assessment designs, all centered around a portfolio and a "backbone" of learning outcomes. Student and teacher experiences seem largely positive: students focus on feedback and show more self-regulation. In the implementation process, training for teachers and students in giving and receiving feedback, and addressing current "summative views" on assessment seem important.

Assessment design decisions in practice: Profile identification in approaches to assessment design

Keywords: Assessment Methods and Tools, Higher Education, Instructional Design, Qualitative Methods

Presenting Author: Javier Fernández, Universidad Autónoma de Madrid, Spain; **Co-Author:** Ernesto Panadero, Universidad Deusto, Spain; **Co-Author:** Daniel García Pérez, European University of Madrid, Spain; **Co-Author:** Leire Pinedo, Universidad de Deusto, Spain

This study aims to investigate how university teachers design their assessment practices. An innovative data collection and analysis process was implemented, using think aloud protocols and thematic analysis in order to detect the different patterns in assessment design among the 16 participants. Three different profiles were found, and called logistic, formative and organizational. There were no clear differences among the profiles regarding university degree, but less-experienced teachers seem to be more aware of formative processes during their assessment design. The assessment practices designed by the participants during our data collection were compared with their usual assessment practices finding significant changes. Our results represent a starting point in the empirical understanding of how university teachers make decisions during the assessment design process. Implications for the educational practice are discussed.

Stress and burnout? University staff's experiences of teaching

Keywords: Emotion and Affect, Higher Education, Qualitative Methods, Teaching/Instruction

Presenting Author:Viivi Virtanen, Häme University of Applied Sciences, Finland; **Co-Author:**Telle Hailikari, University of Helsinki, Finland; **Co-Author:**Mari Murtonen, University of Turku, Finland; **Co-Author:**Anna Parpala, University of Helsinki, Finland; **Co-Author:**Liisa Postareff, HAMK University of Applied Sciences, Finland

Studies have consistently shown teaching to be a profession linked with high levels of stress and burnout (Skaalvik & Skaalvik, 2017). Results indicate that psychological well-being of teachers is important as high levels of prolonged stress is associated with lower job satisfaction, higher risk of burnout and, consequently, has a negative effect on student learning (Collie et al., 2012) as well as teacher attrition. However, there is limited understanding of the stress and burnout of university teachers. Burnout consists of three symptoms: emotional exhaustion, cynicism, and inadequacy (Leiter & Maslach, 2016). This study explores stress and burnout of university teachers when they focus on academy as teaching environment by examining the extent and characteristics for experienced stress and burnout, and in addition, the teachers' coping strategies. Altogether, 32 university teachers from the fields of natural sciences, engineering, and humanities participated in semi-structured interviews. The interview data were qualitatively content analyzed. The preliminary results show that university teachers commonly have experiences of stress or burnout in terms of distress, inadequacy, and exhaustion, but mostly the stress is short-term and occurs situationally. However, some teachers reported severe stress with all the three dimensions of burnout. The preliminary results indicate that imbalance between demands and resources, such as high workload and lack of support are alarming. Also, attention needs to be paid specifically to fostering teachers' pedagogical skills to create interaction with their students, which was a typical source of teachers' stress.

The positive impact of teaching on research in Life Sciences

Keywords: Environmental Education, Higher Education, Qualitative Methods, Synergies between Learning; Teaching and Research

Presenting Author:Jaanika Blomster, University of Helsinki, Finland; **Co-Author:**Viivi Virtanen, Häme University of Applied Sciences, Finland; **Co-Author:**Henna Asikainen, University of Helsinki, Finland; **Co-Author:**Lauri Kontula, The University of Helsinki, Finland; **Co-Author:**Janna Pietikäinen, The University of Helsinki, Finland

How does teaching enhance your research? This question was raised by the academics who participated our co-creative workshop held as a pilot survey for our research project. Although there is a fairly broad understanding of research-based teaching and the research-teaching nexus, the impact of teaching on the research of an academic is poorly understood. This study aims to gain a better understanding on the research-teaching nexus by studying the ways teaching enhances research. For this purpose, altogether 17 academics from Life Sciences were interviewed. The data were collected with semi-structured interviews, and the data is currently being analysed by qualitative content analyses (QCA).The preliminary results showed that (i) it is common to think that only research affects education. However, the results showed (ii) numerous examples of teaching playing a positive role in research and suggested that (iii) the positive influence of teaching on research is a complex and multidimensional phenomenon. The significance of this study lies in exploring academics' self-reported research-teaching nexus in Life Sciences bringing new knowledge of the different aspects of teaching that can positively affect the quality or content of research. This knowledge can have importance in curricular and pedagogical choices academics make, how they reflect their work, and how the process of knowledge production is perceived.

Transformative experiences of novice academics in an online faculty mentoring program

Keywords: E-Learning/Online Learning, Higher Education, Reflection, Researcher Education

Presenting Author:Helga Dorner, Eötvös Loránd University, Hungary; **Co-Author:**Gorana Misic, Bard College Berlin, Germany; **Co-Author:**Margaryta Rymarenko, Central European University Vienna, Austria

This study explores international online mentoring that supports novice faculty at geographically distant universities. Interview data with 30 mentees was analyzed, using an inductive analysis method, to describe how online mentoring supports young academics in their development as novice teachers and to identify how they conceive of this transformative experience in their own professional contexts. Analyses revealed that mentees have qualitatively different conceptualizations of the mentoring process, the role of the mentor and the transformative potential of these professional relationships. A model of transformative experiences was thus created to describe the various cycles through which professional development in an online faculty mentoring program may evolve. Beyond generic implications, the particular dimension of how physical distance impedes mentors' authenticity in mentoring has been identified.

Reading comprehension of students with special educational needs in general education classrooms

Keywords: Learning and Developmental Difficulties, Quantitative Methods, Reading Comprehension, Special Education

Presenting Author:Beata Szenczi, Eotvos Lorand University, Hungary; **Co-Author:**Tibor Vigh, University of Szeged, Hungary; **Co-Author:**Agota Szekeres, Eotvos Lorand University, Hungary; **Co-Author:**Gabriella Zentai, University of Szeged, Hungary

Our study explored reading comprehension of various groups of students with special educational needs studying in general education in comparison with typically developing peers. The study used the original test of the Hungarian National Assessment of Basic Competencies and two modifications to measure reading comprehension of seven groups of randomly selected grade 6 (ages 12-13), 8 (ages 14-15) and 10 (ages 16-17) students with SEN (physical disabilities, hearing impairment, mild intellectual disabilities, visual impairment, speech disorders, autism, and learning disabilities) (N=797). Modified tests included anchor items by which data were calibrated to a common scale by using IRT methods. All tests proved to be reliable (Cronbach-alphas ranged between .88 and .95, EAP/PV reliabilities were between .86 and .95). Grade-level comparative analysis revealed few differences within SEN-groups indicating a relatively stable level of reading comprehension in middle and high school among students with SEN. However, huge differences emerged among SEN subsamples: some groups performed on the level of typically developing students already in grade 6, while for others means are significantly lower even in grade 10. The comparative analysis of the different ability levels of the reading literacy scale indicated that a relatively larger ratio of the heterogeneous SEN subsamples are on lower proficiency levels, where even simpler processes, like locating explicitly stated information, are problematic. Results contribute to growing knowledge on the reading comprehension of SEN students in general education classrooms. The identified within SEN-group reading proficiency characteristics can guide professionals in designing appropriate methods and materials for students with SEN.

Session A 5

23 August 2021 10:45 - 11:45

Session Room 6

Espresso Paper

Assessment and Evaluation, Cognitive Science, Higher Education, Motivational, Social and Affective Processes, Teaching and Teacher Education

Achievement

Keywords: Achievement, Cognitive Skills, E-Learning/Online Learning, Early Childhood Education, Higher Education, Learning Disabilities, Motivation and Emotion, Numeracy, Primary Education, Quantitative Methods, Self-regulation, Teacher Effectiveness, Teaching/Instruction, Video Analysis

Interest group: SIG 04 - Higher Education, SIG 05 - Learning and Development in Early Childhood, SIG 08 - Motivation and Emotion, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Mònica Feixas, Zurich University of Teacher Education , Switzerland

Achievement Emotions Mediate the Link between Goal Failure and Goal Revision

Keywords: Achievement, E-Learning/Online Learning, Motivation and Emotion, Self-regulation

Presenting Author:Maria Theobald, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Jasmin Breitwieser, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Kou Murayama, University of Reading, United Kingdom; **Co-Author:**Garvin Brod, DIPF | Leibniz Institute for Research and Information in Education, Germany

In the present study, we examined students' achievement emotions after they failed to achieve their learning goal, and tested whether students' achievement

emotions after goal failure predicted subsequent goal revision. We tested 344 medical students who prepared for a high-stakes exam using a digital learning platform. Over the course of 40 days, students reported their daily learning goal (before studying) and their anger, tension, joy, and pride (after studying). Daily goal achievement was assessed objectively via log-files. Results revealed that goal failure on a particular day predicted higher levels of anger and tension and lower levels of joy and pride. After goal failure, students lowered their goal on the next day, especially if they had widely missed their goal on the previous day. Goal failure further predicted higher levels of anger and tension, and lower levels of joy and pride. Achievement emotions partially mediated the link between goal failure and goal revision. Students who failed to achieve their goal reported more anger, less joy, and less pride and, in turn, raised their goal on the next day. In sum, results suggest that students generally lower their goals after goal failure, but this downward goal revision is, in part, attenuated by negative emotions.

SES and kindergarteners' math achievement: a multifaceted effect

Keywords: Achievement, Cognitive Skills, Early Childhood Education, Numeracy

Presenting Author: David Munez, National Institute of Education / Nanyang Technological University, Singapore; **Co-Author:** Rebecca Bull, Macquarie School of Education, Macquarie University, Australia; **Co-Author:** Kerry Lee, The Education University of Hong Kong, Hong Kong

Although the relevance of SES on kindergarteners' math achievement is robust, and many explanations have been proposed for these SES disparities with regards to parents' investment in children's development (including parenting practices, financial resources, and exposure to stressors), very few studies have explored how SES affects math in kindergarten. The review of the literature suggests that SES can affect math performance indirectly through other domain-general and domain-specific predictors of math such as WM-Updating capacity and early literacy and numeracy skills. This means that failing to account for these indirect associations may significantly alter the magnitude of the effect of SES on later math disparities. In the current study ($n= 807$), we specifically investigated whether SES disparities in math over the first year in kindergarten are operationalized through those cognitive aspects. Results from a mediation analysis with four parallel mediators showed that WM-Updating capacity, numerical fluency, and math and reading skills at K1 entry served as mediators of the effect of maternal education on later math achievement. They explained four-fifths of the total effect (this was equivalent to half a standard deviation in math).

Investigating SEN and SES – separate or confounded?

Keywords: Achievement, Learning Disabilities, Primary Education, Quantitative Methods

Presenting Author: Jenny Lenkeit, University of Potsdam, Germany; **Co-Author:** Michel Knigge, Humboldt-University of Berlin, Germany; **Co-Author:** Antje Ehler, University of Potsdam / University of Johannesburg, Germany; **Co-Author:** Anne Hartmann, University of Potsdam, Germany; **Co-Author:** Nadine Spörer, University of Potsdam, Germany

Germany is continuously expanding its inclusive education system. Research provides evidence that students with special educational needs (SEN) in inclusive school settings show lower academic achievement and come from lower socioeconomic backgrounds than their peers without SEN. Identifying to what extent the disadvantages originating from both characteristics are confounded in predicting academic achievement, has been neglected in the German educational context. Using data of 1.444 primary school students from a longitudinal study in the state of Brandenburg, this study evaluates to what degree SEN (in the areas of learning, socio-emotional development, language) and socioeconomic background (ISEI, parental education) are confounded to predict academic achievement in reading (t1) and achievement gain (t2). Preliminary analysis indicates that socioeconomic background fully mediates the effect of SEN in socio-emotional development on reading achievement (t1) and reduces the effect of SEN in learning by a quarter. Students with SEN in the area of learning have lower achievement gains in reading than any of their peers and this effect is unconfounded with their socioeconomic background. To better understand the origins of the disadvantage students are exposed to, will improve teachers' and policymakers' choices in designing support measures.

The black box revelation of instructional practices: a multi-level analysis of the transition to HE

Keywords: Achievement, Higher Education, Teacher Effectiveness, Teaching/Instruction

Presenting Author: Mikaël De Clercq, Université catholique de Louvain (UCL); Académie de Recherche et de l'Enseignement Supérieur (ARES), Belgium; **Co-Author:** Justine Jacquemart, Université catholique de Louvain (UCL), Belgium

Instructional practices could be an important lever for student's adjustment to the first year at the university. Yet, the effects of teaching practices are overlooked in the literature about students' transition to Higher Education (HE). In order to overcome this limitation, the current study proposes to analyze the impact of teaching practices on student's achievement and engagement at the university. More precisely, multi-level analyses were carried out on more than 1.200 students scattered on 20 different courses. Instructional practices were measured through both observational grid and students' self-reported questionnaires. Preliminary results highlighted a good consistency of the self-reported measures and significant impacts of instructional practices on behavioral, cognitive and emotional engagement. Upcoming results will assess the effect of teaching practices on student's engagement and academic achievement controlling for individual predictors.

Effects of Peer- and Self-Assessment on Strategy Variability and Performance of Low Performer

Keywords: Achievement, Self-regulation, Teaching/Instruction, Video Analysis

Presenting Author: Sandra Zulliger, Institute for Diversity in Education, Switzerland; **Co-Author:** Buholzer Alois, Institute for Diversity in Education, Switzerland; **Co-Author:** Stella Bollmann, University of Teacher Education of Lucerne, Switzerland; **Co-Author:** Merle Ruelmann, University of Teacher Education of Lucerne, Switzerland

The positive effect of peer-assessment and self-assessment (PASA) on the performance of learners has been widely confirmed. However, whether all students benefit equally from PASA and the specific underlying mechanisms have rarely been studied. This study aimed to determine how often and with what quality PASA occur in everyday mathematics instruction, and which students benefit from them in the context of applying calculation strategies. In fourth-grade primary school classes in German-speaking Switzerland, a double lesson on division was videographed. A total of 52 teachers and 634 students completed a paper-and-pencil questionnaire, and the students solved a performance test on division. Multilevel analyses showed that the quality of SA has a positive effect only for low-performing students, who use a larger repertoire of calculation strategies when SA is of good quality. The use of more calculation strategies helps them to perform better.

Session A 6

23 August 2021 10:45 - 11:45

Session Room 16

Espresso Paper

Educational Policy and Systems, Motivational, Social and Affective Processes, Teaching and Teacher Education

Attitudes and Beliefs

Keywords: Attitudes and Beliefs, Citizenship Education, Emotion and Affect, Experimental Studies, Higher Education, Motivation, Motivation and Emotion, Pre-service Teacher Education, Quasi-experimental Research, Religious Studies, Science Education, Self-efficacy

Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education, SIG 19 - Religions and Worldviews in Education

Chairperson: Ylva Lindberg, Jönköping University, Sweden

Motivation Towards Creativity: The Importance of Need Satisfaction and Perceived Value of Creativity

Keywords: Attitudes and Beliefs, Higher Education, Motivation, Motivation and Emotion

Presenting Author: Marek Urban, Jan Evangelista Purkyně University, Czech Republic; **Co-Author:** Ondra Pesout, J. E. Purkyne University, Czech Republic; **Co-Author:** Kamila Urban, Institute for Research in Social Communication, Slovak Academy of Sciences, Slovakia; **Co-Author:** Jiří Kombrza, J. E. Purkyne

University, Czech Republic

Valuing creativity was theorized as being an impactful predictor of actual creative outcomes. However, more empirical evidence is needed to establish the relationship between individuals' perceived value of creativity and their creative performance. From the perspective of the Self-Determination Theory, satisfaction of basic psychological needs and intrinsic motivation to learn were added along with the perceived value of creativity to a structural equation model in order to predict performance on a set of creative thinking tasks. The model was tested on a sample of 368 university students. The results indicated that the perceived value of creativity mediated the relationship between intrinsic motivation and creative performance. Furthermore, the perceived value of creativity was directly and indirectly predicted by psychological needs satisfaction and directly predicted by intrinsic motivation. The perceived value of creativity proved to be an important motivational construct that can predict creative performance among college students.

Relevance—a Multidimensional Construct—and its Relation to Affective Constructs in Physics Courses

Keywords: Attitudes and Beliefs, Higher Education, Motivation, Science Education

Presenting Author: Almer Gungor, KU LEUVEN, Belgium; **Co-Author:** Mieke De Cock, KU LEUVEN, Belgium

This preliminary survey study investigates physics-related affective characteristics of non-physics majors (biology & pharmacy), multidimensional structure of relevance and its relation to the affective characteristics in introductory physics courses ($N=240$). In this study relevance—defined as a “personally meaningful connection”—is multidimensional. The Physics Affective Characteristics Scale (PACS) revised by the Authors (2021) was used to collect data. It includes 51 items in 11 subscales: relevance (everyday life, future career, other courses), interest (situational, personal), anxiety (course, test), student motivation, self-efficacy, self-concept, and achievement motivation, which are collectively referred to as affective characteristics. Results of the Confirmatory Factor Analysis showed that the model fits well supporting a multidimensional relevance construct. The results revealed that relevance of future career to relevance of everyday life (.58) or other courses (.58) were closely related, while the correlation between relevance of everyday life and other courses was relatively lower (.38), but still statistically significant. According to the students' responses, they perceive physics relevant to their other courses, to some degree to their future career, but not as clear to their everyday lives; are motivated to achieve, and don't feel anxious in courses, but slightly anxious in exams; are to some extent interested, confident, and motivated to acquire further knowledge/skills in physics. The findings are discussed in terms of their significance for theory, educational practice, and research.

Collegial casework in inclusive teacher education: A self-efficacy tool for pre-service teachers?

Keywords: Attitudes and Beliefs, Pre-service Teacher Education, Quasi-experimental Research, Self-efficacy

Presenting Author: Scarlett Madeline Kobs, Humboldt Universität zu Berlin, Germany; **Co-Author:** Saskia Liebner, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany; **Co-Author:** Simon Wagner, University of Potsdam, Germany; **Co-Author:** Franziska Rogge, University of Potsdam, Germany; **Co-Author:** Karsten Krauskopf, University of Applied Sciences Potsdam, Germany; **Co-Author:** Michel Knigge, Humboldt University Berlin, Germany

Teachers' self-efficacy is one aspect of their professional competence. In the context of inclusive education higher self-efficacy is associated with more individualized lesson design. Self-efficacy is drawn from personal or vicarious experience, oral feedback or affective arousal (Bandura, 1997). Collegial casework can be seen as vicarious experience or oral feedback. Therefore, it can be assumed that collegial casework has a positive effect on the self-efficacy of pre-service teachers (Tietze, 2010). So far, however, there is no research on this. The present study aims to investigate the role of collegial casework in fostering inclusion-related self-efficacy of pre-service teachers. For this purpose, two quasi-experimental studies ($n_1=167$, $n_2=162$) were conducted in inclusive education courses at the University of Potsdam (ProInk, Knigge et al., 2020). All students participated in collegial casework as part of these studies. Two groups can be distinguished: collegial casework on one's own case or on someone else's case. The dependent variables were self-efficacy in relation to creating an inclusive classroom climate and the inclusive teacher personality (Kopp, 2009) as well as inclusion-related cognitive attitudes (Antonak & Larrivee, 1995) and affective attitudes (Avramidis et al., 2000; german translation: Knigge & Rotter, 2015). In addition, the intensity and evaluation of collegial casework as well as relevant socio-demographic characteristics were collected. First analyses identify previous self-efficacy as well as cognitive and affective attitudes towards inclusion as relevant factors influencing self-efficacy at the end of the course. Further analyses include the second sub-study and students' socio-demographic variables as further possible factors influencing self-efficacy.

Teacher students' personal worldviews and career motives – how are they related?

Keywords: Attitudes and Beliefs, Motivation, Pre-service Teacher Education, Religious Studies

Presenting Author: Laura Hirsto, University of Eastern Finland, Finland

The aim of this paper is to investigate teacher students' career motives relations to their personal worldview in terms of commitment and the effects that the worldviews have had in their lives and decisions. There is quite a lot of research on the motives through which teacher students have chosen their career path. Various researchers suggest that the general motive categories include intrinsic, extrinsic and altruistic motives. The theoretical perspectives into teacher students motives for choosing teachers education was operationalized into a questionnaire, in which first year teacher students. The questionnaire also included items related to the students' worldview commitment and effects of personal worldviews on their goals. Four factors were found of the motives: Self-fulfillment motive, Instrumental motive, Mission/Altruistic motive and Other peoples' influence. According to the results, Self-fulfillment motive and Mission/Altruistic motives were found the most important. Much less teacher students reported Instrumental motive and Other peoples' influence. Male students reported significantly more often Other people's influence as a motive. Furthermore, religious identity group was related to the Self-fulfilment motive in such a way that non-religious group more often reported Self-fulfilment motive compared to religious majority group. Mission/Altruistic motive correlated significantly with the extent to which teacher students' reported, that their personal worldview had affected their goals and the amount of commitment into their personal worldviews. These results will be discussed with respect to theoretical perspectives and earlier research, as well as in terms of significance of personal worldviews in university studies.

Online and offline youth participation in Hong Kong's anti-extradition bill social movement

Keywords: Attitudes and Beliefs, Citizenship Education, Emotion and Affect, Self-efficacy

Presenting Author: Frank Reichert, The University of Hong Kong, Hong Kong; **Co-Author:** Anna Fiedler, The University of Hong Kong, Hong Kong

Triggered by a now shelved extradition bill in 2019, mass demonstrations in Hong Kong quickly turned into an anti-government movement. Social media platforms were critical for communication and the coordination of protest actions. Further, creative forms of participation, such as performances, translation of news, and citizens' press conferences, emerged. As university students were particularly active in the movement, this analysis examines Hong Kong student's collective and political self-efficacy as well as their satisfaction with the political and socio-economic situation in Hong Kong—considered crucial factors in the mobilization of masses according to social psychological theory and social movement theory—to understand how these factors may have influenced students' offline and online participation in the social movement. We use panel data from students who participated in one survey shortly before the social movement took hold and in another survey a year later, to address the research questions. Structural equation modeling disentangles the role of efficacy and dissatisfaction and their interactions, controlling for other variables. The results show differential associations of efficacy and dissatisfaction and indicate that political dissatisfaction is a particularly strong correlate of protest actions. We discuss these results with respect to the conceptualization of social movement participation, the link between offline and online participation, as well as theories of protest action. Based on the findings, we propose improvements to civic education and youth policy, including youth empowerment, the promotion of skills for perspective-taking, and teacher development in the context of digitalization.

Fostering preservice teachers' beliefs and motivation for engaging with research methods

Keywords: Attitudes and Beliefs, Experimental Studies, Motivation, Pre-service Teacher Education

Presenting Author: Helene Zeeb, University of Freiburg, Germany; **Co-Author:** Thamar Voss, University of Freiburg, Germany

A basic understanding of research methods is an important prerequisite for evidence-based teaching. However, preservice teachers often believe that research skills are useless or too difficult to acquire. Such low value and expectancy beliefs can impair their motivation to engage with research methods. In the present study, we investigated the effects of two online interventions on preservice teachers' research-related beliefs and motivation. The participants ($N = 95$) worked either on a utility value (UV) intervention, a growth mindset (GM) intervention, or a control intervention. The UV intervention conveyed the core message that

research skills are useful for teachers; the GM intervention conveyed the core message that abilities are malleable. All interventions consisted of informational and active parts, and were similar in structure and length. There was a follow-up assessment after two weeks. The results indicate differential effects of the interventions: The UV intervention had a strong effect on beliefs about the usefulness of research methods. The GM intervention had a strong effect on growth mindsets, which was still present after two weeks. Expectancy beliefs about one's ability to develop research skills were not affected by the interventions. After two weeks, motivation for research methods was descriptively higher in the UV and GM conditions, compared to the control condition, yet these differences were statistically not significant. We conclude that motivational interventions are a promising way to counter dysfunctional beliefs. Future research should find ways to implement interventions in teacher education programs, in order to foster students' long-term motivation for research methods.

Session A 7

23 August 2021 10:45 - 11:45

Session Room 2

Panel Discussion

Learning and Instructional Technology

Multimodal Measurement of SRL in Advanced Learning Technologies: 5 years of pioneering research.

Keywords: Interdisciplinary, Learning Analytics, Metacognition, Self-regulation

Interest group: SIG 16 - Metacognition

Chairperson: Inge Molenaar, Radboud University Nijmegen, Netherlands

The E-CIR "Measuring and supporting students' self-regulated learning in adaptive educational technologies" has been working on this theme for 5 years. In this panel, we like to discuss the progress and the development of the field over the last 5 years. In a concerted interdisciplinary dialogue, we have combined psychology, educational sciences with learning analytics and artificial intelligence in our research efforts to further develop methodologies to measure cognition, metacognition, affect and emotions during learning. Where our focus initially was on the measurement of these SRL processes, it slowly moved to incorporating new measurement into new forms of support for SRL during learning. In the panel, we will highlight lessons learned as described in the two special issues, discuss future endeavors and emphasize the importance of a new type of SRL theory as proposed by Peter Reimann.

Multimodal Measurement of SRL in Advanced Learning Technologies: 5 years of pioneering research.

Presenting Author:Roger Azevedo, University of Central Florida, United States; **Presenting Author:**Sanna Järvelä, University of Oulu, Finland; **Presenting Author:**Dragan Gasevic, Monash University, Australia; **Presenting Author:**Maria Bannert, Technical University of Munich (TUM), Germany

The E-CIR "Measuring and supporting students' self-regulated learning in adaptive educational technologies" has been working on this theme for 5 years. In this panel, we like to discuss the progress and the development of the field over the last 5 years. In a concerted interdisciplinary dialogue, we have combined psychology, educational sciences with learning analytics and artificial intelligence in our research efforts to further develop methodologies to measure cognition, metacognition, affect and emotions during learning. Where our focus initially was on the measurement of these SRL processes, it slowly moved to incorporating new measurement into new forms of support for SRL during learning. In the panel, we will highlight lessons learned as described in the two special issues, discuss future endeavors and emphasize the importance of a new type of SRL theory as proposed by Peter Reimann.

Session A 8

23 August 2021 10:45 - 11:45

Session Room 9

Single Paper

Motivational, Social and Affective Processes

Educational Psychology and Higher Education

Keywords: Educational Psychology, Emotion and Affect, Goal Orientation, Higher Education, Motivation, Motivation and Emotion

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Fabian Zehner, Germany

"I'm Tired of Black Boxes": Emotional Experiences When Teaching Digitally in a Time of Pandemic

Keywords: Educational Psychology, Emotion and Affect, Higher Education, Motivation and Emotion

Presenting Author:Anne Christiane Frenzel, University of Munich, Germany; **Co-Author:**Anton Marx, Ludwig-Maximilians-Universität, Germany; **Co-Author:**Carolin Schwab, Ludwig-Maximilians-Universität (LMU), Germany

How did moving higher education teaching and learning into digitally supported environments due to the COVID-19 pandemic affect the teaching experiences of university instructors? We tried to answer this question by replicating and extending the study by Daumiller et al. (2019) to compare the experiences of instructors teaching in a classroom in normal times and those teaching digitally in a time of pandemic. Participants answered (a) a basic questionnaire, and (b) several session-specific diaries. Analyses of the basic questionnaire revealed that Sample 1 ($N=95$; data obtained from Daumiller et al., 2019) and Sample 2 ($N=99$; data obtained from the present replication) were comparable in their perceived autonomy, competence, relatedness, stress at work, and self-efficacy before the pandemic. When judged against their prior experiences, instructors perceived their relatedness and satisfaction with teaching to be reduced. Analyses of the aggregated session-specific diary data revealed that when teaching digitally in a time of pandemic, the satisfaction of the basic needs for autonomy and relatedness was poorer and emotional experiences less favorable (less enjoyment, more anger, tendency towards more boredom) compared to classroom teaching. The more the digital teaching environment allowed for quasi-live experiences (i.e. seeing students through their cameras), the more related instructors felt to their students. These results imply that it is important to foster digital teaching skills to enhance the satisfaction of the need for autonomy and to create digital environments that allow for building relationships with students in order to optimize instructors' emotional experiences when teaching digitally.

Temporal Dynamics Between Faculty Goals, Work-stress, and Performance in Teaching and Research

Keywords: Educational Psychology, Goal Orientation, Higher Education, Motivation

Presenting Author:Martin Daumiller, University of Augsburg, Germany; **Co-Author:**Markus Dresel, University of Augsburg, Germany

Motivation constitutes a barely explored—yet presumably crucial—condition of the professional experience and behavior of faculty. In particular, achievement goals can be expected to matter for their work-stress and performance. Prior research supports this assumption through preliminary, cross-sectional findings restricted to the teaching or the research domain. In the present paper, we comprehensively examine the temporal effects of achievement goals on work-stress and performance while considering teaching and research simultaneously. To this end, we conducted a longitudinal study including 681 German faculty members that were surveyed four times over a total of two years. Multivariate latent difference score modeling attested that in both domains, mastery-approach goals were positively related to subsequent development of performance, while performance was also positively related to subsequent development of task-approach and learning-approach goals, creating a positive loop. For overall work-stress, our results implied that for its development, primarily research goals mattered (with performance-avoidance and work-avoidance goals being risk factors), while high work stress was paired with subsequent reduction of adaptive mastery-approach goals in both domains. This highlights the importance of achievement goals for work-stress and performance of faculty and sheds light on their complex dynamics that can also meaningfully inform achievement goal research in other contexts. An important implication of these findings for faculty motivation is that focusing on the goals in the research domain (instead of the teaching domain) can be a particularly worthwhile direction to support faculty well-being.

Faculty Grit: How Long-term Passion and Perseverance Relates to Teaching and Research Success

Keywords: Educational Psychology, Higher Education, Motivation, Motivation and Emotion

Presenting Author:Jordan Jaeger, University of North Dakota, United States; **Co-Author:**Chia-lin Chang, University of North Dakota, United States; **Co-Author:**Robert Stupnisky, University of North Dakota, United States

Faculty at four-year universities have many responsibilities, including teaching and research, that call for long periods of work before a significant payoff. Grit, which is passion and perseverance towards long term goals, may help explain why some professors attain their goals more frequently than others. The goal of this paper to examine how faculty member's grit relates to their emotions and success in teaching and research. Counseling faculty ($N = 131$) from various US universities completed an online survey. As this was the first known administration of the grit scale to a faculty population, we first tested for validated and reliability, which results showed the measure to be acceptable for further analysis. Latent variable correlations indicated, in the domain of research, grit correlated positively with enjoyment and success, and negatively with anxiety. In the domain of teaching, grit correlations with emotions and success were far weaker. Structural equation models further showed grit as important to faculty research (but less so in teaching), as it predicted emotions and success. These findings have implications for faculty development as grit has been a relatively understudied construct in this population.

Session A 9

23 August 2021 10:45 - 11:45

Session Room 4

Single Paper

Developmental Aspects of Instruction, Motivational, Social and Affective Processes

Reasoning in Primary Science Education

Keywords: Developmental Processes, Emotion and Affect, Numeracy, Primary Education, Reasoning, Science Education, Student Learning

Interest group: SIG 08 - Motivation and Emotion, SIG 20 - Inquiry Learning

Chairperson: Kim van Broekhoven, Radboud University, Netherlands

The process of learning scientific reasoning: a latent transition analysis

Keywords: Primary Education, Reasoning, Science Education, Student Learning

Presenting Author:Erika Schlatter, Radboud University, Netherlands; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Ard Lazonder, Radboud University, Netherlands

In primary education children learn, among other things, scientific reasoning: the process of hypothesizing, experimenting, interpreting data and drawing conclusions. This important skill helps children learn science content and aids understanding of the world around them. Research has shown that the component scientific reasoning skills develop at a different pace and with substantial variation among same-age children. However, how these differences play out on the short term, for instance during a lesson series, is less well known. Latent transition analysis (LTA) can help shed light on such instant developmental differences and was used in the current study to analyze worksheets completed by 166 children during five hands-on science lessons. The study sought to answer two research questions: (1) can different proficiency profiles be found, and if so (2) how do children transition between these profiles? Four profiles were found in the data (see Figure 1): high achievers (high scores on all subskills), low achievers (low scores on all subskills), experimenters (low scores on all subskills except experimenting), and theorists (high scores on all subskills except experimenting). Children transitioned between these profiles regularly (see Figure 2), in particular during the first half of the lesson series. Extreme transitions (between low and high achievers, or between theorists and experimenters) gradually diminished, and transitions from profiles with high experimenting scores to profiles with low experimenting scores were rare. Knowing these individual differences in the development of scientific reasoning helps us further understand its development, and can help teachers provide personalized instruction.

Concurrent and longitudinal relations between mathematics anxiety and performance in Grade 1 and 2

Keywords: Developmental Processes, Emotion and Affect, Numeracy, Primary Education

Presenting Author:Riikka Mononen, University of Oslo, Norway; **Co-Author:**Markku Niemivirta, University of Eastern Finland, Finland; **Co-Author:**Johan Korhonen, Åbo Akademi University, Finland; **Co-Author:**Marcus Lindskog, Uppsala University, Sweden; **Co-Author:**Anna Tapola, University of Helsinki, Finland

We investigated the concurrent and developmental relations between mathematics anxiety (MA), symbolic numerical magnitude processing (SNMP) and arithmetic skills (AS) among 264 Norwegian children ($M_{age} = 6$ y 9 m). Children's MA, SNMP and AS were measured in Grade 1 and 2, together with a curriculum-based mathematics test. All constructs correlated significantly within each time point, and the rank-order stability over time was high, particularly in SNMP and AS. By means of latent change score modeling, we found overall increases in SNMP and AS over time, but no change in MA. Most interestingly, changes in AS and MA were correlated (i.e., steeper increase in AS was linked with less steep increase in MA), as were changes in SNMP and AS (i.e., improvement in SNMP was associated with improvement in AS). Only the initial level of AS predicted Grade 2 mathematics test scores. Boys scored higher on the initial level of SNMP, and also showed steeper increase in it. Our findings not only evidence developmental relations between different mathematical skills during early school years, but also that changes in children's MA are somewhat connected with changes in arithmetic performance. The differential effects associated with MA (developmentally only linked with AS) and gender (predicting only changes in SNMP) call for further longitudinal research on the different domains of mathematical skills.

Session A 10

23 August 2021 10:45 - 11:45

Session Room 14

Single Paper

Learning and Special Education, Lifelong Learning

Attitudes, Beliefs and Teacher Professional Development

Keywords: Attitudes and Beliefs, Collaborative Learning, E-Learning/Online Learning, Early Childhood Education, Lifelong Learning, Mixed-method Research, Special Education, Teacher Professional Development

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 11 - Teaching and Teacher Education, SIG 15 - Special Educational Needs

Chairperson: Yuyao Tong, The University of Hong Kong, China

The role of departmental leadership for PLC characteristics, depending on teacher beliefs.

Keywords: Attitudes and Beliefs, Collaborative Learning, Lifelong Learning, Teacher Professional Development

Presenting Author:Jasja Valckx, Ghent University, Belgium; **Co-Author:**Ruben Vanderlinde, Ghent University, Belgium; **Co-Author:**Geert Devos, Ghent University, Belgium

This study explores whether the relationship between departmental leadership (group-oriented and development-oriented) and professional learning community (PLC) characteristics (collective responsibility and reflective dialogue) varies in departments, depending on teachers with a traditional or a constructivist beliefs structure. Data were collected from 197 teachers in 30 departments in 26 Flemish (Belgian) secondary schools via an online teacher survey. Data were analysed using multi-group path analyses. Results show no differences depending on teachers' educational beliefs. They show that teachers with a group-oriented departmental leader experience more collective responsibility and report a higher frequency of reflective dialogue in their department. This study suggests that group-oriented department heads play a critical role in facilitating PLC characteristics in departments. Therefore, department heads should be carefully selected based on different interpersonal skills to develop their department to function as a PLC. In addition, they must be sufficiently professionalized to deal with and lead a team. Department heads should support group dynamics and contribute to a culture of collaboration.

What predicts teachers' use of digital learning? Explaining digital learning in special education.

Keywords: Attitudes and Beliefs, E-Learning/Online Learning, Special Education, Teacher Professional Development

Presenting Author: Moritz Börnert-Ringleb, Leibniz University Hannover, Germany; **Co-Author:** Gino Casale, University of Wuppertal, Institute for Educational Research, Germany; **Co-Author:** Dr. Clemens Hillenbrand, University Oldenburg, Institute for Special Education and Rehabilitation, Germany

The school closures during the COVID-19 outbreak triggered a shift towards digital learning. Whilst this in itself is already a major challenge for mainstream education, the implementation of digital learning poses an even bigger challenge for special education teachers, as they are confronted with different learning requirements which might hinder digital learning processes. Previous research in this area has already identified obstacles to digital learning in mainstream education, but the conditions of digital learning in special education remain unclear. This article aims to provide insights on conditions of digital learning in special education at the teacher-, school-, and student-levels. We examined whether the use of digital learning in special education is predicted by (1) teachers' self-efficacy, attitudes and their perceived usability of digital learning, (2) teachers' perceived organisational support and (3) the perceived obstacles on the student-level. A sample of $N = 722$ special education teachers in Germany participated in the study during the COVID-19 pandemic. The results of mixed models indicate that specific self-efficacy in digital learning and perceived support by the school principal were the strongest predictors for the use of digital learning, while a lack of students' self-regulation and parental support represented major obstacles. The results underline the need for both specific training in digital learning for special education teachers, and well-structured interventions in digital learning for students with special needs.

At the crossroad of child rights participation and Q methodological studies

Keywords: Attitudes and Beliefs, Early Childhood Education, Mixed-method Research, Teacher Professional Development

Presenting Author: Renske de Leeuw, Saxion University of Applied Sciences, Netherlands; **Co-Author:** Adrian Lundberg, Malmö University, Sweden; **Co-Author:** Renata Aliani, University of Melbourne, Australia

This contribution aims to critically discuss young children's rights in educational research through the examination of Q methodological publications reporting from early childhood education settings. This emergent research approach possesses a plurality of advantages for young participants with limited verbal literacy skills. The following research question guided the investigation: To what extent is Q methodology applied to capture children's views in early childhood education research, where a) the children themselves rank order items and b) other individuals act as study participants? In addition, a particular focus was put on participatory study designs. A total of 74 individual Q methodological studies in early childhood education research were identified and analyzed. Surprisingly enough, only four engaged children in the actual ranking activity. We, therefore, conclude that practitioners and scholars in early childhood settings should become familiar with Q methodology and its flexibility concerning the type of stimuli that could be used. By exploring this crossroad of child rights participation and Q methodology, young children's rights in research practices can be strengthened.

Session A 11

23 August 2021 10:45 - 11:45

Session Room 5

Single Paper

Higher Education, Teaching and Teacher Education

Conceptual Change

Keywords: Conceptual Change, Higher Education, In-service Teacher Education, Metacognition, Misconceptions, Mixed-method Research, Pre-service Teacher Education, Teacher Professional Development, Teaching Approaches

Interest group: SIG 03 - Conceptual Change, SIG 11 - Teaching and Teacher Education

Chairperson: Michelle Jutzi, University of Teacher Education Bern, Switzerland

Reducing Developmental Psychology Misconceptions Via Refutational Teaching at University

Keywords: Conceptual Change, Metacognition, Misconceptions, Teaching Approaches

Presenting Author: Stephanie Pieschl, Technical University of Darmstadt, Germany; **Co-Author:** Nicola Vivienne Glumann, Technische Universität Darmstadt, Germany

Psychological misconceptions are extremely prevalent and persistent, most likely because people consider psychological knowledge "common sense". However, such misconceptions may have negative effects, for example, if teachers or psychologists apply their false beliefs about human development and learning to their teaching or counselling practices. Previous research has shown that refutational teaching can reduce misconceptions and raise metacognitive awareness about one's own misconceptions. We conducted a 2x2x2 mixed design study with $n = 48$ participants within a regular developmental psychology university course. Misconceptions were measured at the start and the end of the course (within-subject: T1 vs. T2), half of the misconceptions were refuted during the course, the other half served as quasi-control condition (within-subject: course vs. non-course content). Students either only attended the twelve refutational lectures or they attended additional six seminar sessions (between-subject: seminar attendants vs. others). We also attempted to explore the relevance of students' epistemological beliefs but could not replicate the factor structure of this instrument. ANOVA results show main effects of time and content and a time-by-content-interaction for performance on the misconception questionnaire: Performance increased significantly regarding the developmental psychology course content only. Thus, our easy-to-implement refutational teaching approach was successful. However, we found no significant effects regarding participants' metacognitive awareness: Participants differed substantially in their metacognitive awareness and we found no systematic relationship between their metacognitive confidence judgments and their performance. These results are practically relevant for teaching psychology and offer additional theoretical insights into the nature of misconceptions.

University teachers' professional vision, misconceptions, experience and pedagogical training

Keywords: Conceptual Change, Higher Education, Mixed-method Research, Teacher Professional Development

Presenting Author: Neea Heinonen, University of Helsinki, Finland; **Co-Author:** Nina Katajavuori, University of Helsinki, Finland; **Co-Author:** Mari Murtonen, University of Turku, Finland; **Co-Author:** Ilona Södervik, University of Helsinki, Finland

The aim of the study was to investigate the level and quality of life science university teachers' professional vision and potential misconceptions related to teaching and learning before and after basic university pedagogical course. We also studied whether this five-credit course can have an effect on university teachers' professional vision and misconceptions concerning teaching and learning. Before and after participating the course, a total of 68 life science university teachers wrote their interpretations of a tailor-made video, which depicted a typical teaching-learning situation in the university. Teachers' misconceptions were examined by true/false-items with open-ended explanations. Teachers at different levels of pedagogical expertise varied in their professional vision, i.e. how they noticed and interpreted pedagogically significant incidents in teaching-learning situation. In addition, teachers had on average $M = 1,88$ misconceptions related to teaching and learning. Moreover, teachers who had more misconceptions related to teaching and learning had lower skills in professional vision. Groups with different level of expertise benefitted from the course differently. The findings from the study show that teachers' previous teaching experience and pedagogical studies play a role for the development of teachers' pedagogical expertise in terms of their professional vision and (mis)conceptions. These results indicate that even one university pedagogical course can have the potential to affect participants' professional vision and (mis)conceptions of teaching and learning, especially when teachers' have already some previous pedagogical studies.

Does information literacy moderate the effectiveness of conceptual change to reduce misconceptions?

Keywords: Conceptual Change, In-service Teacher Education, Misconceptions, Pre-service Teacher Education

Presenting Author: Nicola Vivienne Glumann, Technische Universität Darmstadt, Germany; **Co-Author:** Stephanie Pieschl, Technical University of Darmstadt, Germany

Subjective beliefs that do not correspond to the current state of research or even contradict it, are widespread, especially regarding psychological topics. This

includes the prevalent misconception about the coherence principle, a phenomenon that is crucial for an optimal design of learning materials: Many instructors mistakenly believe that adding interesting details will always benefit learning, even if such details are irrelevant to the central learning content and thus might be a distraction. To counteract misconceptions, both refutational and anecdotal texts have been effective in previous research. In a two-by-two experiment with pre-service and in-service teachers ($n = 140$), we compared the effectiveness of these two approaches in counteracting misconceptions about the coherence principle (between-subject: refutational vs. anecdotal) measured before and afterwards (within-subject: T1 vs T2). Furthermore, we examined participants' information literacy as a potential moderator variable. We hypothesized that high information literacy should facilitate conceptual change via more competent handling of the new information provided by refutational or anecdotal texts. Our results show that both text versions about the coherence principle led to significant reductions of this misconception, with the refutational text showing significantly stronger effects than the anecdotal text. However, we found no main effect or moderation by participants' self-assessed information literacy. Our results have practical implications for teacher education as well as theoretical implications regarding the psychological mechanisms underlying misconception revision.

Session A 12

23 August 2021 10:45 - 11:45

Session Room 11

Single Paper

Cognitive Science, Higher Education, Teaching and Teacher Education

Educational Psychology, Teaching and Instruction

Keywords: Cognitive Skills, Educational Psychology, Higher Education, Neuroscience, Reading Comprehension, Teacher Professional Development, Teaching/Instruction

Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education, SIG 22 - Neuroscience and Education

Chairperson: Joost Jansen in de Wal, University of Amsterdam, Netherlands

Brain activity correlates of domain-specific knowledge in diagram use for math word problem solving

Keywords: Cognitive Skills, Educational Psychology, Neuroscience, Teaching/Instruction

Presenting Author: Hiroaki Ayabe, National Institute for Physiological Sciences, Japan; **Co-Author:** Emmanuel Manalo, Kyoto University, Japan; **Co-Author:** Satoru Yokoyama, Saitama University, Japan; **Co-Author:** Michio Nomura, Kyoto University, Japan

Diagram use is considered effective for math word problem solving. However, despite such use, many students still fail to produce correct solutions. Such failure may be attributable to inadequate domain-specific knowledge about diagram use that matches the problem. For example, students have to know how to construct and use graphs to solve problems involving time and locational changes, and tables to solve problems involving rule-bound quantitative progression. Knowledge and problem mismatches will lead to incorrect solutions. We also propose that differences in brain activity, indicative of differences in cognitive processes, corresponding to different domain-specific knowledge will be detectable. We tested these propositions in a 2 (Instruction: table vs. graph; between-participant) \times 3 (Phases: pre-instruction, post-instruction, follow-up; within-participant) experimental design. Forty participants were divided into two groups according to instruction (table use or graph use). During the pre-instruction, post-instruction, and follow-up phases, they were administered two problems to solve (different but isomorphic across phases): one in which tables would be helpful for solving, and the other graphs. During post-instruction, continuous EEG brain signals were recorded and independent components analysis was performed. Problem solving performance confirmed the domain specificity of diagram use knowledge: improvements were made and maintained only in matched conditions (i.e., diagram instruction received matched problem-type to solve). EEG power spectrum analysis revealed significant changes under the table-matched condition in the prefrontal, temporal-occipital, and temporal-parietal area; and under the graph-matched condition in the parietal-occipital, left temporal-occipital, right frontal area. These confirm detectable brain responses that differentiate domain-specific diagram use knowledge.

Promoting the Acquisition of Core Practices: Contrasting Direct Instruction With Productive Failure

Keywords: Educational Psychology, Reading Comprehension, Teacher Professional Development, Teaching/Instruction

Presenting Author: Imke Broß, Universität Freiburg, Germany; **Co-Author:** Anja Prinz, University of Freiburg, Germany; **Co-Author:** Matthias Nückles, University of Freiburg, Germany

Core practices of teaching are instructional activities that are frequently occurring and central to the teaching profession. However, it is unclear how the acquisition of core practices can best be supported in teacher education. In an experimental study with $N = 97$ teacher students, we compared three instructional approaches with regard to their effectiveness for the acquisition of the core-practice "facilitating the discussion of expository texts". To implement the core practice, we used reciprocal teaching as an evidence-based script. The direct-instruction group was first provided with a theoretical introduction and modelling before giving the opportunity to enact the core practice. The productive-failure group started with a naïve enactment prior to the theoretical introduction and modelling. The control group received a theoretical introduction and modelling first and then engaged in a structured group discussion. Results showed that the direct-instruction and productive-failure groups acquired higher conceptual knowledge and better analytic skills with regard to the core practice than the control group. Thus, concerning these outcome variables, the opportunity to enact the core practice seems to be more effective than discussing it, whereas it seems rather irrelevant at which point of time in the training this opportunity is given. Concerning the ability to enact the core practice with pupils, however, the direct-instruction group outperformed the productive-failure group. Therefore, if the goal is to improve teacher students' ability to competently apply a core practice, starting with a theoretical introduction and modelling before giving the opportunity to practice is more beneficial than the reverse sequence.

What Makes a Good Teacher? A Practice-Based Conceptualization of University Teacher Expertise

Keywords: Educational Psychology, Higher Education, Teacher Professional Development, Teaching/Instruction

Presenting Author: Esther van Dijk, Universiteit Utrecht / Hogeschool Utrecht, Netherlands; **Co-Author:** Manon Kluijtmans, UMC Utrecht, Netherlands; **Co-Author:** Jan van Tartwijk, Utrecht University, Netherlands; **Co-Author:** Marieke van der Schaaf, University Medical Center Utrecht, Netherlands

What makes a good university teacher? This question is central to a multitude of publications from both research and practice contexts, but there is a lack of consensus about the answer. In this study we therefore investigate international common ground about what constitutes teacher expertise by conducting a systematic review of 46 teaching frameworks. In line with literature about core practices, we synthesized these frameworks from a task-based perspective. Six teacher tasks were found: 'teaching and supporting learning', 'educational design', 'assessment and feedback', 'educational leadership and management', 'educational scholarship and research', and 'professional development'. Additionally, three dimensions for expertise development were found: better task execution, executing a wider range of tasks, and executing tasks with a larger sphere of influence. With this study we expand our understanding of university teacher expertise and provide a basis for further research. In practice, the synthesis can be used for reflection by teachers as well as for shaping faculty development and institutional recognition and reward policies. The results of the present study and the core practices from primary and secondary education show overlap, but it also seems there is less emphasis on educational leadership and management and educational scholarship and research in core practices in primary and secondary education. Insights in these similarities and differences can be used for reflection about further development in all these education contexts.

Session A 13

23 August 2021 10:45 - 11:45

Session Room 1

Single Paper

Higher Education, Learning and Social Interaction

Social Interaction

Keywords: Attitudes and Beliefs, Cognitive Development, Early Childhood Education, Higher Education, Qualitative Methods, Social Aspects of Learning and Teaching, Social Interaction

Interest group: SIG 04 - Higher Education, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Mirjami Ikonen, University of Eastern Finland, Finland

Differences in the quality of interaction in nurseries and relation to child development

Keywords: Cognitive Development, Early Childhood Education, Qualitative Methods, Social Interaction

Presenting Author: Mailina Petritsch, Karl-Franzens University of Graz, Austria; **Co-Author:** Tanja Sonnleithner, Karl-Franzens-University of Graz, Austria

For most children, under the age of three years, attending Early Childhood Education and Care (ECEC) institutions is part of their normal biography. After a quantitative expansion of ECEC-institutions, an increasing focus lies on the quality in the nurseries. Numerous studies show that the interaction quality is the decisive element for optimal children's development. The EIK-Study sheds light on the effects of the interaction quality on newly entered children in nurseries (N=89). The results show that noticeable leaps in the children's development (motor skills, speech, cognition and social-emotional areas were measured) can be recorded in nursery with a high interaction quality (measured with GraziAS 0-3). The youngest of our society need sensitively-responsive, supportive, stimulating and emotionally present early childhood educators in order to be adequately supported in their individual development.

Insights on the teacher-student relationship at university from the teachers' perspective

Keywords: Higher Education, Qualitative Methods, Social Aspects of Learning and Teaching, Social Interaction

Presenting Author: Gerda Hagenauer, University of Salzburg, Austria; **Co-Author:** Franziska Muehlbacher, University of Salzburg, Austria; **Co-Author:** Mishela Ivanova, University of Salzburg, Austria

Based on the theoretical assumption that positive secure relationships are of core relevance for optimal human functioning (Baumeister & Leary, 1995), it can be assumed that such relationships are also relevant in the context of HE teaching. However, to date comparably little research has been conducted on the quality and influencing factors of the teacher-student relationship in HE. This is where the present research fulfils a function: Based on qualitative interviews with Australian university teachers, the study explores which indicators HE teachers perceive as core elements of a high-quality relationship with their students and which factors contribute to the development of the teacher-student relationship. The interviews were analysed based on qualitative content analysis. The results show that the relationship quality was perceived positively on the professional dimension if both students and teachers were mutually engaged in the teaching-learning process and if mutual respect was experienced. Other important characteristics were that of providing professional support to students and being approachable and available for them. The interpersonal facet of the teacher-student relationship was experienced positively if personal support and care were perceived and if the teachers and students got to know each other interpersonally. With regard to influencing factors, both contextual (e.g. teaching load, time-pressure) and individual factors (personality, but also age, gender) contributed to the formation of the teacher student relationship. Based on the findings, a summarizing conceptual model on the antecedents and quality characteristics of the teacher-student relationship is proposed. Implications for theory development and for practice will be provided.

Teacher biased behaviours and interactions with students

Keywords: Attitudes and Beliefs, Qualitative Methods, Social Aspects of Learning and Teaching, Social Interaction

Presenting Author: Christine Rubie-Davies, University of Auckland, New Zealand; **Co-Author:** Gamze Inan-Kaya, University of Istanbul, Turkey

Research suggests that some teachers are biased towards particular student groups (e.g., ethnic minority and special needs students). The current study aimed to investigate how teacher bias towards students was portrayed in classrooms. The study used a qualitative observational design to record the portrayal of teacher bias in primary and secondary schools. Four hours of observations in each of 20 classrooms were undertaken. Differential behaviours included variations in the quality and quantity of questions asked to some students rather than others, monitoring needs and progress, and frequency and types of feedback, with favoured students consistently benefitting. Further, teachers were more engaging with those they favoured, smiling at them more, making more eye contact and joking with them. These behaviours were not evident towards students for whom teachers appeared to be negatively biased. These students were closely monitored often related to disciplinary matters and, at times, teachers publicly criticised or humiliated these students. The recording of teacher biased behaviours provides a basis for developing a future intervention designed to help teachers reduce biased interactions with students, and, to treat all students equitably.

Session A 14

23 August 2021 10:45 - 11:45

Session Room 15

Invited Symposium

Learning and Social Interaction

SIG 26: How to teach argumentation, dialogue and reasoning for citizenship?

Keywords: Argumentation, Citizenship Education, Conversation/Discourse Analysis, Cooperative/Collaborative Learning, Culture, Higher Education, Instructional Design, Literacy, Peer Interaction, Reasoning, Social Interaction

Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Claire Polo, France

Discussant: Michael Baker, France

In democracy, civic education implies argumentation, dialogue and reasoning. But engaging into fruitful discussion about social, complex issues requires specific individual and group skills and appropriate dialogue setting. Analytical tools have been developed to analyze the efficiency of dialogical teaching (Hennessy et al., 2016). Presentation 1, with a dialogic approach, points interactional skills for apprehending cultural literacy, embodied in precise discussion practices. More specifically, argumentation was long taught based on models of a 'good' discussion (Eemeren & Grootendorst, 1992). But recent empirical approaches step away from them to describe how students actually argue, reporting rich practices combining diverse knowledge with values and emotions; and sociocognitive with communicative competences (Baker, Andriessen & Järvelä, 2013, Polo et al., 2016). Consistently, presentation 2 analyzes university students' argumentation on discrimination, showing that sociocognitive conflict implies face-work through a specific talk structure. How to teach argumentation, dialogue and reasoning for citizenship beyond pre-established models, taking into account nowadays' reality? Presentation 3 raises pedagogical design issues by questioning the effect of position assignment on classroom debate, a great opening to further discussion. Baker, M., Andriessen, J., & Järvelä, S., (Eds) (2013). *Affective Learning Together*. Routledge. Eemeren, F.H. van, & Grootendorst, R. (1992). *Argumentation, communication, and fallacies: A pragma-dialectical perspective*. Hillsdale, NJ: Lawrence Erlbaum Associates. Polo, C., K. Lund, C. Plantin, G. P. Niccolai (2016). Group Emotions: The Social and Cognitive Functions of Emotions in Argumentation. *International Journal of Computer-Supported Collaborative Learning* 11(2), 123-156.

Building active citizenship and global competence through dialogue

Presenting Author: Fiona Maine, University of Cambridge, United Kingdom

This paper reports the outcome of a three-year Horizon 2020 project aimed at supporting the development of students' cultural literacy, considered here as a dialogic social practice. Focusing on core dispositions of tolerance, empathy and inclusion, the DIALLS project (Dialogue and Argumentation for cultural Literacy Learning in Schools) created a programme of learning for pre-primary, primary and secondary students prioritising the development of dialogic interactions. Wordless picturebooks and short films were used as stimuli for rich and diverse discussions about cultural values related to citizenship and belonging. Whilst dialogue and argumentation in the classroom have been studied with a view to their impact on learning outcomes, here we employed innovative dialogic

teaching practices to focus students' attention on how they fundamentally relate to each other and manage multiple perspectives in discussions that do not always have clearly identified positional outcomes. Our results show that central to the success of these discussions were the students' use of invitation and elaboration with each other as dialogic functions of talk. However, a third aspect of their talk showed itself as a core indicator of classrooms where ideas could be genuinely heard and engaged with: the use of provisionality in language as a tool to express ideas, negotiate proposals and create an underpinning social cohesion. Drawing on data from 30 classrooms in England, this paper reports how these three features enabled authentic and inclusive classroom discussions to support students to become active and responsible citizens.

A sociocultural analysis of argumentation among young adults at University

Presenting Author:Nathalie Muller Mirza, Université de Genève, Switzerland

In this paper, we examine written argumentation of students participating in a pedagogical design in the frame of a course on social psychology at the University. This course aimed at supporting analysis of social issues like racism and discrimination. 35 students participated to the Master course called "Dialogue, argumentation and learning". At the end of the semester, they were invited to work in small groups of 3-4 participants and to discuss together about a controversial question related to the experience of Blue/Brown eyes designed by Jane Elliott in her classroom in the late 1960. Adopting a sociocultural approach in psychology of learning that assumes that argumentation is a complex dialogical activity, we analyse sequences of argumentation and show in particular how the participants faced the issue of the "disagreement" and co-elaborated their argumentative positions during the interactions, and how they co-constructed learning in the dynamics of the discussion. This paper seeks to contribute to the reflection on the learning processes in argumentation and on the conditions of these dynamics. In this Invited symposium, the findings will contribute to the discussion of one of the main purposes of education which is empowering students and encouraging interpersonal collaboration, and allowing students to look at social issues from more than one point of view.

The role of position assignment in classroom debate – a video study in civic education

Presenting Author:Dorothee Gronostay, TU Dortmund University, Germany

This paper deals with the role of assigned positions for in-class debate in citizenship teaching and learning. Previous research has shown that the type of argumentation dialogue influences argument quality and learning outcomes, e.g., that cooperative discussion outperforms competitive debate in this regard. However, debate is an important dialogue type in civic education that commonly involves the assignment of positions (pro/contra) in order to ensure controversy in class, i.e., part of the students advocate a position in accordance/at variance with their personal position (coincidence/divergence condition). To date there is little knowledge regarding possible effects of such position assignment. In part of a video study in ten German civic education classes (8th/9th grade), students were randomly assigned to debate positions in order to investigate effects on debate participation and personal views. The classes received the same learning unit on political extremism and well-fortified democracy (4 x 45 min.) and then prepared and conducted a controversial fishbowl debate. Results show that students in the divergence condition were less likely to voluntarily participate in the debate, but more likely to adopt their personal views to their assigned position. These findings support the notion that the divergence and coincidence condition differ in how they trigger cognitive conflict and/or confirmation bias and therefore generate distinct tasks with different learning potentials within the same dialogue format. Future research could further investigate the causes for a reduced willingness to participate in debate in the divergence condition (e.g., loss of motivation and/or more difficult task).

Session B 1

23 August 2021 12:00 - 13:00

Session Room 3

Single Paper

Assessment and Evaluation, Cognitive Science

Experimental Studies and Cognitive Skills

Keywords: Achievement, Bilingual Education, Cognitive Skills, Early Childhood Education, Experimental Studies, Learning and Developmental Difficulties, Mathematics, Second Language Acquisition

Interest group: SIG 01 - Assessment and Evaluation, SIG 03 - Conceptual Change

Chairperson: Angel Torres-Toukoumidis, Ecuador

Underachievement in Mathematics: Do Cognitive Profiles Play a Role beyond Conative Factors?

Keywords: Achievement, Cognitive Skills, Experimental Studies, Mathematics

Presenting Author:Simona Daguati, ETH Zurich, Switzerland; **Co-Author:**Elsbeth Stern, ETH Zurich, Switzerland

Abstract

This study aims at investigating whether cognitive profiles, especially working memory (WM) functions, can explain underachievement in mathematics beyond conative factors, as several studies showed that WM functions strongly predict mathematical achievement across time. While most studies have examined this relationship in primary school children (Raghbar, Barnes, & Hecht, 2010), we investigated 95 adolescents with above-average reasoning abilities, divided into under-achievers ($n = 35$) and high-achievers ($n = 60$). The selected students were presented with nine WM tests and two math tests. We could confirm that the two groups clearly differ in both math tests. Moreover, there is a significant difference in performance on the WM tests related to the WM function of simultaneous storage and processing. This suggests that differences in WM functions could be an additional explanatory variable for underachievement in mathematics and that WM functions seem to play an additive role supplementary to general reasoning abilities. References

Raghbar, K. P., Barnes, M. A., & Hecht, S. A. (2010). Working memory and mathematics: A review of developmental, individual difference, and cognitive approaches. *Learning and Individual Differences*, 20 (2), 110 - 122. Retrieved from <http://www.sciencedirect.com/science/article/pii/S1041608009000788> (Perspectives on Math Difficulty and Disability in Children) doi: <https://doi.org/10.1016/j.lindif.2009.10.005>

Exploring the cognitive processes of students and the mediating role of language in CLIL assessments

Keywords: Bilingual Education, Cognitive Skills, Experimental Studies, Second Language Acquisition

Presenting Author:Xing San Teng, The University of Hong Kong, Hong Kong; **Co-Author:**Janet H. Hsiao, The University of Hong Kong, Hong Kong; **Co-Author:**Yuen Yi Lo, The University of Hong Kong, Hong Kong

In content and language integrated learning (CLIL) programmes, students learn content knowledge through their second/foreign/additional language (L2). Considering the dual goal of content and language learning in CLIL programmes, valid CLIL assessments should assess students' learning progress in both

dimensions. At the same time, the language used in assessments (i.e. students' L2) is a critical factor that directly impacts students' performance. This raises concerns about assessment validity and fairness. This study aims to provide a more in-depth understanding of the role of language in CLIL assessments through examining students' cognitive processes using eye-tracking technology and stimulated recalls. 52 students with different English (L2) proficiency levels who studied Biology through L2 were recruited. Students were asked to complete some carefully selected questions, during which their cognitive processes were captured with an eye-tracker. Eye movement data were compared between more and less proficient English learners. The preliminary results showed that less proficient English learners manifested significantly longer regression duration when processing multiple choice questions compared to their proficient counterparts, which may imply that less proficient English learners encountered more difficulties when processing questions. Also, proficient English learners tended to focus on multiple choice options while less proficient ones tended to focus on the questions when processing multiple choice questions. These results illuminate the potential mediating effect of language on students' thinking processes and strategies when their content knowledge is assessed in their L2. This study has significant insights for CLIL assessment design and pedagogy.

The motor–executive function link in children with typical and poor visual-motor integration skills

Keywords: Cognitive Skills, Early Childhood Education, Experimental Studies, Learning and Developmental Difficulties

Presenting Author:Michelle N. Maurer, University of Bern, Switzerland; **Co-Author:**Claudia Roebers, University of Bern, Switzerland

Although the relationship between visual-motor integration (VMI) and executive functions (EF) has been reported repeatedly in the past, we still know little about this specific interrelation. VMI and EF are crucial school readiness factors associated with early academic achievement, both cross-sectional and longitudinal. With the present study we aim to gain a deeper insight into the association between VMI and EF in children with typical and poor motor skills. Specifically, we investigate VMI and EF in children with typical and poor VMI skills, based on children's performance on the Copy Design task. Thirty-three children aged 5–6 with poor VMI skills were compared to thirty-three children matched for age and gender with typical VMI skills a) in terms of their EF skills and b) the specificity of the VMI–EF link. Results revealed that children with poor compared to typical VMI skills showed significantly poorer EF. Additionally, the pattern of the VMI–EF link differed substantially between the two groups: While VMI were significantly associated with all EF tasks in children with typical VMI skills, VMI was uniquely and very strongly related to working memory in children with poor VMI skills. These findings indicate that different EF are involved during copying in children with typical and poor VMI skills. The relevance of the findings and the insights into the performance deficits of children with poor VMI skills will be discussed in light of a developmental perspective.

Session B 2

23 August 2021 12:00 - 13:00

Session Room 7

Single Paper

Assessment and Evaluation, Higher Education

Online Learning and Educational Technology

Keywords: E-Learning/Online Learning, Educational Technology, Higher Education, Professions and Applied Sciences, Qualitative Methods, Technology

Interest group: SIG 14 - Learning and Professional Development, SIG 27 - Online Measures of Learning Processes

Chairperson: Eleni Sinakou, University of Antwerp, Belgium

Detecting and evaluating programming expertise - The case of Stack Overflow

Keywords: E-Learning/Online Learning, Educational Technology, Professions and Applied Sciences, Qualitative Methods

Presenting Author:Markus Nivala, University of Gothenburg, Sweden; **Co-Author:**Alena Seredko, University of Gothenburg, Sweden; **Co-Author:**Tanya Osborne, University of Gothenburg, Sweden; **Co-Author:**Thomas Hillman, University of Gothenburg, Sweden

Due to its educational and professional relevance, the detection and evaluation of expertise has been widely discussed in the scientific literature. Recently, large online databases and digital platforms have made it possible to combine activity metrics to assess individual's performance in their domain of expertise. Our aim in this study is to examine how members perceive and interpret expertise metrics produced in a large online community where programmers share knowledge and develop expertise.

Thirteen members with different levels of professional expertise were interviewed and asked to evaluate the expertise of other users and the relation between reputation score and programming expertise. The results showed that, in addition to the quantitative metrics, the members employed varying qualitative strategies to complement their assessment of expertise. This was partly due to the perceived inadequacy of the quantitative metrics. Furthermore, the participants made a clear distinction between platform expertise and actual programming expertise. While there was general agreement that these forms of expertise correlate, there were differing opinions as to what extent. However, most participants suspected that the platform metrics could play a role in job recruitment processes.

The results call for caution when interpreting metrics that are a product of complex interactions among humans, platform mechanics and algorithms. Yet, such metrics offer methodological opportunities to trace, evaluate and discuss expertise and its development. In general, the datafication of educational systems and professions has implications for practice and research on professional development. It is increasingly important to understand different metrics and their interpretation.

Eye see what you did there. Predicting comprehension of a video lecture based on gaze visualizations

Keywords: E-Learning/Online Learning, Educational Technology, Higher Education, Technology

Presenting Author:Ellen Kok, Utrecht University, Netherlands; **Co-Author:**Matt Sibbald, McMaster University, Canada; **Co-Author:**Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

The shift to online teaching due to the Corona crisis has led to many challenges. One of them is that, unlike in face-to-face lectures, in online lectures, teachers lack access to (non-verbal) cues such as nodding to check if their students are still 'with them' and might not know if students comprehended material until after a test. The increasing availability of (low-cost) eye-tracking devices provides a promising solution. 'With-me-ness' can be operationalized using eye-tracking technology. A promising practical application could be to visualize this gaze data to inform teachers about students' level of comprehension. Given that 1) Eye-tracking measures of with-me-ness correlate with comprehension, 2) teachers can predict students' comprehension from their gaze visualizations, 3) We understand whether and how different gaze visualization techniques impact this prediction. In Experiment 1, 36 students watched a video lecture while being eye-tracked. We found significant correlations between the overlap in gaze locations between student and teacher, and students' total fixation durations on relevant information, and comprehension of the lecture. In Experiment 2, 50 participants predicted students' comprehension based on six different gaze visualization techniques (dynamic and static versions of scanpaths, heatmaps, and focusmaps), and rated their ease of prediction. We found that people can use gaze visualizations to predict learners' comprehension, and we found only minor differences between visualization techniques. Further research should investigate if teachers can also act on the information provided by gaze visualizations (e.g., to provide additional explanations, or speed up) during lectures and thereby improve students' learning.

ICT usage in educational settings among youngsters in Estonia in the background of COVID-19 pandemic

Keywords: E-Learning/Online Learning, Educational Technology, Qualitative Methods, Technology

Presenting Author:Gertha Teidla-Kunitsõn, Tallinn University, Estonia; **Co-Author:**Merike Sisask, Tallinn University, Estonia; **Co-Author:**Halliki Põld, Tallinn University, Estonia

ICT usage in educational settings among youngsters in Estonia in the background of COVID-19 pandemicGertha Teidla-Kunitsõn, Tallinn University (Estonia)Merike Sisask, Tallinn University

Halliki Põld, Tallinn University

The aim of the presentation is to understand, what are the beneficial and harmful aspects of ICT (info-communication technology) usage in educational settings

among young people; and how do youngsters consider their education as preparation for adult life in the digital era. Both of these aims are placed in the context of COVID-19 pandemic and the emergency situation in Estonia in spring 2020, as the pandemic had a large impact on ICT usage in education. During November - December 2020 four semi-structured pilot interviews were carried out, capturing different socio-economical backgrounds and geographic location of the participants. The preliminary results highlight that although online learning created a more loose time-management appreciated by youngsters, the contact-less lessons were missed as the latter offered an environment and time for focusing. Students did experience falling behind in their studies, but that was realised only in the next study-year. More individual tasks were given, although synchronous lessons were valued by students and they were experienced more useful. Surprisingly the students did not associate education and their teachers' work as preparation for their adult life in the digital era. The interviewees would take hybrid lessons or learning as something to put in practice in the future, regardless of the COVID-19 pandemic. Keywords: ICT, education, distance-learning, DigiGen.

Session B 3

23 August 2021 12:00 - 13:00

Session Room 13

Single Paper

Higher Education, Learning and Instructional Technology

Educational Technology

Keywords: Collaborative Learning, Computer-supported Collaborative Learning, Content Analysis, Educational Technology, Higher Education, Instructional Design, Learning Technologies, Motivation, Primary Education, Reflection

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 14 - Learning and Professional Development, SIG 17 - Methods in Learning Research

Chairperson: Nicola Vivienne Glumann, Technische Universität Darmstadt, Germany

Learning with a Pedagogical Agent: does the Task Specificity of Self-efficacy Measure Matter?

Keywords: Educational Technology, Instructional Design, Motivation, Primary Education

Presenting Author: Kate Xu, Open University of the Netherlands, Netherlands; **Co-Author:** Xiaoxia "Silvie" Huang, Western Kentucky University, United States; **Co-Author:** Sascha Schneider, Chemnitz University of Technology, Germany; **Co-Author:** Lijia Lin, East China Normal University, China

Self-efficacy plays an important role in the development of learner's motivation and learning performance. However research is still limited regarding whether it can be fostered by digital instructional techniques such as embedding an animated pedagogical agent in the learning environment. Social cognitive theory proposes that having a role model fosters the learner's sense of self-efficacy. A pedagogical agent may fulfil a social modelling role during task instruction, and thus enhances self-efficacy, which in turn may enhance motivation and performance. Furthermore, different measurement strategies exist in self-efficacy research but are rarely examined in experimental settings. Based on a sample of 132 primary school students, the present study operationalized self-efficacy measurements via questions that were task specific (e.g. how confident the learner is to solve a specific problem) and task general (e.g. how confident the learner is to solve problems in a particular subject or domain). Additionally, the effect of a pedagogical agent was examined in terms of: (a) whether adding an animated modelling agent increases the learner's sense of self-efficacy, and (b) whether both measures of self-efficacy capture an increase in self-efficacy after instruction and predict situational interest and performance. The results showed that a pedagogical agent did not affect the learner's self-efficacy. Only task-specific self-efficacy captured the change in self-efficacy after instruction. While the task-specific self-efficacy was a stronger predictor for performances, the task general self-efficacy more strongly predicted situational interests. The study suggests that the operationalization of self-efficacy measurement is important when investigating motivation or performance outcomes.

Simulation Enhanced Interprofessional Health Education and Professional Identity Development

Keywords: Content Analysis, Educational Technology, Higher Education, Reflection

Presenting Author: Hadil Elsayed, University of Gothenburg, Sweden; **Co-Author:** Markus Nivala, University of Gothenburg, Sweden; **Co-Author:** Liisa Carlzon, Simulatorcentrum i Väst, Sahlgrenska University hospital, Sweden

Introduction Simulation enhanced interprofessional education (SIPE) is a valuable pedagogical approach in health education. SIPE learning environments face many challenges but remain understudied. This study seeks to examine how students from different disciplines address issues related to knowledge and professional identity development within a SIPE learning environment and whether their conceptualizations of their own performances coincide with those of their educators. Methods Data from development plans composed by medical as well as nursing students (n=90) engaging in a SIPE experience as well as from a facilitator survey (n=13) were analyzed using manifest inductive content analysis. The analysis was informed by actor network theory and Schön's reflection on action model. Results Students reflected on their performance in relation to personal attributes, other team members as well as the surrounding environment. They also reflected on the consequences of their actions and future professional growth. There were observable intergroup differences in terms of knowledge enactment. Facilitators' and students' perceptions of performance were mostly aligned. Leadership issues were problematic for students as well as for facilitators. Conclusions The student' engagement in SIPE helped them to face their professional strengths/ weaknesses and to develop a prototype of their professional identity. More work is needed to improve the design of SIPE environments and provide adequate support to students as well as facilitators. The findings of this study have several implications for education, professional practice as well as for future empirical work.

Temporal analysis procedure for computer-supported collaborative learning: Literature review

Keywords: Collaborative Learning, Computer-supported Collaborative Learning, Educational Technology, Learning Technologies

Presenting Author: Joni Lämsä, University of Jyväskylä, Finland; **Co-Author:** Raija Hämäläinen, University of Jyväskylä, Finland; **Co-Author:** Pekka Koskinen, University of Jyväskylä, Finland; **Co-Author:** Jouni Viiri, University of Jyväskylä, Finland; **Co-Author:** Emilia Lampi, University of Jyväskylä, Finland

Along with addressing questions regarding what learning occurs, computer-supported collaborative learning (CSCL) research should also focus on *how* learning occurs. To address this and better understand the building blocks of productive CSCL, many researchers have recognised the need to analyse CSCL's temporal aspects. The lack of a procedure for the temporal analysis of CSCL, however, reduces the comparability of these studies. We have undertaken a systematic literature review to propose this procedure. The procedure includes six key operations found in the included 78 studies: 1) proposing theoretically framed research questions (mostly descriptive) regarding the temporal aspects of CSCL; 2) setting up the context (mostly online interaction mediated by communication technologies); 3) collecting process data (mostly asynchronous online discussions); 4) conceptualising events from the process data (mostly communication units, such as messages); 5) conducting one or more temporal analysis method (mostly social network analysis or sequential analysis); and 6) interpreting the outcomes with the temporal analysis and possible data or method triangulation (mostly sequences of two or more events regarding learner interaction or the thoughts and ideas developed in their interaction). A temporal analysis procedure can help design both theory-driven studies and methodological experiments advancing CSCL research. In our presentation, we discuss how our study increases scholarly understanding regarding the temporal aspects of CSCL.

Session B 4

23 August 2021 12:00 - 13:00

Session Room 18

Single Paper

Assessment and Evaluation, Teaching and Teacher Education

Writing and Literacy

Keywords: Computer-assisted Learning, Higher Education, Language (Foreign and Second), Learning Approaches, Literacy, Quasi-experimental Research, Teaching Approaches, Writing/Literacy

Interest group: SIG 12 - Writing

Chairperson: Christian M. Stracke, Open University of the Netherlands, Netherlands

Student and Teacher Feedback Literacy and Engagement with Written Feedback in EFL writing

Keywords: Higher Education, Language (Foreign and Second), Literacy, Writing/Literacy

Presenting Author: Abderrahim Mamad, University of Szeged, Doctoral School of Education, Hungary; **Co-Author:** Tibor Vigh, University of Szeged, Hungary

The aim of this theoretical paper is to investigate teachers' and students' feedback literacy, combined with its synthesis with written feedback in EFL writing, and to suggest a framework based on both the literature review and the adaptation of existing frameworks of student and teacher feedback literacy to the EFL writing context. While several studies have focused on teacher-oriented and product-based written corrective feedback, there is scant research on student-centered and process-based written feedback as new approaches that involve students' active role in receiving and constructing feedback during the writing and the rewriting process. Drawing on the literature review on written feedback in EFL writing, and previous frameworks of student and teacher feedback literacy, the suggested research framework involves students' and teachers' engagement with written feedback. More importantly, the paper calls for the need (1) to promote students' and teachers' capabilities as feedback literate and (2) to engage effectively in the written feedback and writing process in which teachers, students and peers have a shared responsibility to improve the writing performance. By doing so, both the quality of written feedback and the students' satisfaction with it can be achieved during the teaching and learning context. This paper significantly supports the new conceptualization of written feedback as a process and encourages its practice in relation to the advanced capabilities of feedback literacy in higher education. Based on the proposed framework, this paper also suggests a new area of investigation in which feedback literacy can be implemented in EFL writing.

An Exploratory Study on how Myanmar EFL Students Benefit from Grammarly Feedback

Keywords: Computer-assisted Learning, Language (Foreign and Second), Quasi-experimental Research, Writing/Literacy

Presenting Author: Nang Kham Thi, University of Szeged, Doctoral School of Education, Hungary

Abstract Realizing the ultimate importance of linguistic accuracy in writing and understanding the contextual factors including time constraints and excess workload of writing teachers to provide individualized support on students' writing, an increasing number of studies has examined whether and to what extent automated feedback helps students improve their writing. Within this framework, exploring the nature of automated feedback and the aspects of writing it helps students improve their writing play integral parts in informing writing teachers about how it can be integrated into writing instruction. This paper critically examines the potential use of *Grammarly* in a general English classroom as an assistance feature to support teacher feedback. Using an experimental design, the study compared the EFL students' ($n=27$) first drafts and revised texts to explore the nature of *Grammarly* feedback: the feedback strategies it employs, the error categories it primarily targets, and examined how the student writers made use of *Grammarly* feedback in their revision, and in what ways they think the feedback is effective. Results showed that *Grammarly* offers three types of corrective feedback (i.e., indirect, direct, and metalinguistic), focusing on grammatical correctness, usage, mechanics, punctuation, and conciseness. Students were able to make effective use of *Grammarly* feedback in their revisions and most of them found it useful and easy to use, indicating that it helps them improve grammatical and vocabulary awareness. However, due to the limitations, we recommend the use of *Grammarly* feedback in conjunction with the teacher feedback.

Teachers' Assessment of Multiple Text Integration

Keywords: Learning Approaches, Literacy, Teaching Approaches, Writing/Literacy

Presenting Author: Liron Primor, Hemdat Academic College, Israel; **Co-Author:** Sarit Barzilai, University of Haifa, Israel

Integrating multiple texts in writing is a valuable competence that is challenging for students of all ages. Numerous studies have examined how students integrate texts; However, we still know very little about how integration is perceived and taught by teachers. The aim of this study was to examine how teachers assess students' integrative essays in order to shed light on their conceptions of integration and their instructional practices. We invited forty-six language teachers to assess three integrative essays written by students. The essays included several problems such as low integration, one-sided perspective, and no references to sources. Teachers were asked to grade the essays and describe their strengths and weaknesses. Teachers detected less than half of the problems in the essays. Teachers most often noticed lack of integration, lack of references, and basing a conclusion on personal experience rather than on the texts. Yet, about a third of the teachers failed to detect these problems. Open analysis of teachers' assessments indicated that teachers mostly focused on language use and on organizing, integrating, and connecting important information from the texts while citing them appropriately. Teachers paid less attention to knowledge construction quality, for example, to forming generalizations, juxtaposing viewpoints, and drawing conclusions. These results suggest that teachers' perceptions of integration could be broadened to include aims such as transforming knowledge, generating new knowledge, and reaching well-justified conclusions. Teaching with these aims in mind is valuable not only for language instruction but also for learning in the disciplines and in everyday life.

Session B 5

23 August 2021 12:00 - 13:00

Session Room 6

Single Paper

Assessment and Evaluation, Motivational, Social and Affective Processes

Writing, Literacy and Self-Regulation

Keywords: Assessment Methods and Tools, Emotion and Affect, Primary Education, Reflection, Self-regulation, Writing/Literacy

Interest group: SIG 12 - Writing

Chairperson: Megan Wiedbusch, University of Central Florida, United States

Assessing Self-Regulation in Grade 1 Writers: A Reliability and Validity Study

Keywords: Assessment Methods and Tools, Primary Education, Self-regulation, Writing/Literacy

Presenting Author: Ashley Bildfell, Western University, Canada; **Co-Author:** Perry Klein, The University of Western Ontario, Canada; **Co-Author:** Jill Dombroski, Western University, Canada; **Co-Author:** Christine Giese, Western University, Canada; **Co-Author:** Kristen Sha, Western University, Canada; **Co-Author:** Serena Thompson, Western University, Canada

Self-regulation is a key concept in recent writing models such as the Not So Simple Model of Writing (Berninger & Chanquoy, 2012). However, few studies have considered the reliability and validity of the measures used to assess self-regulation in writing. The purpose of the current study was to evaluate the reliability and validity of the Interview on Self-Regulation in Early Writing, a novel genre-specific measure designed to assess self-regulation in writing in Grade 1. The data from 117 Grade 1 students were used to evaluate the reliability and validity of the interview. The interview had excellent inter-rater reliability and good internal consistency once unreliable items were removed. Principal Components Analysis showed that there were two dimensions: a transcription dimension and a composition dimension which provided support for the internal structure of the interview. No significant relation between the interview and a curriculum-based measure of spelling was found which established discriminant validity. Students in the SRSD instructional condition demonstrated significantly more knowledge of self-regulation of composition than both the control and strategy-only groups. Further, in a mediation analysis, effect of condition on posttest holistic writing quality was largely mediated by self-regulation of composition. Taken together, these analyses suggested the interview had predictive validity. In sum, the current study provided empirical evidence that supported the reliability and validity of the Interview on Self-Regulation in Early Writing. Further, it begins to bridge the gap between content-neutral self-regulation in early childhood and subject-specific self-regulation in later grades.

The impact of facial expressions of emotion on self-regulation during self-reflective writing

Keywords: Emotion and Affect, Reflection, Self-regulation, Writing/Literacy

Presenting Author: Michelle Taub, University of Central Florida, United States; **Co-Author:** Joel Schneier, University of Central Florida, United States

The goal of this study was to examine how facial expressions of basic emotions were associated with keystroke-logging behaviors while undergraduate students worked on a reflective writing task. 62 college students taking a first-year writing course at a large American university participated in this study. Keystrokes were logged and facial expressions were video recorded during a 30-minute self-reflective writing task. Results revealed that an increased facial expression of disgust was associated with longer average pause and production times, and increased facial expression of joy was associated with shorter average production times during a self-reflective writing task. These results have implications for designing writing environments that provide instructional support based on real-time data from keystrokes and facial expressions, and will help better understand how different emotions directly impact writing and how this can be used to improve writing instruction.

Session B 6

23 August 2021 12:00 - 13:00

Session Room 8

Single Paper

Teaching and Teacher Education

Motivation and Teacher Effectiveness

Keywords: Educational Technology, Motivation and Emotion, Pre-service Teacher Education, Self-efficacy, Teacher Effectiveness, Teacher Professional Development, Teaching/Instruction

Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education

Chairperson: Becky Bergman, Chalmers University of Technology, Sweden

A simulated teaching intervention boosts preservice teacher self-efficacy and classroom readiness

Keywords: Motivation and Emotion, Self-efficacy, Teacher Effectiveness, Teacher Professional Development

Presenting Author: Jade Rushby, The University of New South Wales, Australia; **Co-Author:** Robert Klassen, University of York, United Kingdom

We report two studies investigating the development and testing of a multi-session 'scenario-based learning' (SBL) intervention delivered to 1164 preservice teachers in the UK and Australia. The intervention provided participants with a series of text and video classroom scenarios, an opportunity to rate the appropriateness of responses for each scenario, a space for self-reflection about the responses, and real-time feedback from experienced teachers about the chosen responses to each scenario. In Study 1, 463 preservice teachers in the UK and Australia completed four SBL sessions over four weeks, with outcome measures including teaching self-efficacy and classroom readiness. In Study 2, 701 preservice teachers in Australia completed three SBL sessions over three weeks with teaching self-efficacy as the outcome measure. Study 1 results showed significant positive change in teaching self-efficacy and classroom readiness from pretest to week 4. Study 2 showed significant positive change for self-efficacy. At the completion of the intervention, participant feedback indicated increases in teaching confidence and classroom readiness (in Study 1) and increased teaching self-efficacy in Study 2. The two studies show how SBL interventions can be profitably integrated into the ITE curriculum to help prepare preservice teachers for teaching roles.

How does the learning environment affect the emotional exhaustion of beginning teachers?

Keywords: Motivation and Emotion, Pre-service Teacher Education, Teacher Effectiveness, Teacher Professional Development

Presenting Author: Stefanie Gaekle, DZHW - German Centre for Higher Education Research and Science Studies, Germany; **Co-Author:** Claudia Menge, German Centre for Higher Education Research and Science Studies (DZHW), Germany; **Co-Author:** Andreas Ortenburger, DZHW - German Centre for Research on Higher Education and Science Studies, Germany

The transition from teacher education to work and working as a teacher in general are known to be potentially stressful (see e. g., Voss & Kunter 2020). In Germany, the transition to work is meant to be simplified by the so-called „preparatory service“, a second phase of teacher training that contains mostly practical training (see Klusmann et al. 2008a and Dicke et al. 2015). This contribution investigates the learning environment in the preparatory service and its effects on the emotional exhaustion of beginning teachers using structural equation modeling (SEM). The model includes different aspects of the learning environment, such as the interaction with, and support from, the training teacher, seminar leader and fellow trainee teachers. The analyzes are conducted using data from the German National Educational Panel Study (NEPS; Blossfeld et al. 2011), Starting Cohort 5, that accompanies first-year students of the winter semester 2010/2011 from their studies into their professional lives. Data on the learning environment in the preparatory service (measured by 23 items on seven subscales) and the emotional exhaustion (measured by one four-item subscale of the Maslach Burnout Inventory) are available for n=1,442 participants. The results will be controlled for gender, various personality traits and the school types. In preliminary analyzes, the factor structures of the latent constructs were confirmed. A SEM with only a few subdimensions of the learning environment showed that instrumental support of relevant actors in the preparatory service, such as training teachers ($b=-0.27$) and seminar leaders ($b=-0.11$), significantly reduces the (prospective) teachers' exhaustion.

How do university lecturers express their emotions in class? Evidence from an event-sampling study.

Keywords: Educational Technology, Motivation and Emotion, Teacher Effectiveness, Teaching/Instruction

Presenting Author: Katharina Thies, District of Lippe, Germany; **Co-Author:** Robert Kordts, University of St.Gallen, Norway

In their teaching, university lecturers are confronted with situations that can trigger emotions in them and may demand a regulation of these emotions. For these situations, they often apply reaction-oriented emotion regulation strategies, which, among other things, target the expression of emotions. It is not known whether and how often university lecturers express specific emotions in teaching sessions and what relations exist between the experience of emotions and the expression of emotions. This study investigates the emotional expression of enjoyment, anxiety, and anger among N = 80 university lecturers by using an experience-sampling survey following N = 802 lecturers. The findings indicate that university lecturers express joy mostly authentically, while they tend to suppress the expression of anxiety and anger. Different intra- and interindividual relations (i.e., within and between the instructors) were found for the specific emotions. For example, a university lecturer with a strong experience of anxiety in a teaching session tends to suppress the emotional expression; a tendency that was not present among university lecturers with a generally strong experience of anxiety. The data underline the need for differentiated analyses of intra- and interindividual correlations of emotional processes in teaching situations.

Session B 7

23 August 2021 12:00 - 13:00

Session Room 10

Single Paper

Lifelong Learning, Teaching and Teacher Education

Inquiry Learning and Reasoning

Keywords: Comprehension of Text and Graphics, Design-based Research, Game-based Learning, Inquiry Learning, Lifelong Learning, Mathematics, Pre-service Teacher Education, Primary Education, Qualitative Methods, Reasoning, Teaching Approaches

Interest group: SIG 20 - Inquiry Learning, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Petra Weckström, Sweden

Exploring pre-service teacher moves for supporting student reasoning utilizing a scriptwriting task

Keywords: Mathematics, Pre-service Teacher Education, Qualitative Methods, Reasoning

Presenting Author:Victoria Shure, Humboldt-Universität zu Berlin, Germany

The development of mathematical reasoning skills has increasingly been of focus in research concerning the teaching and learning of mathematics. Using a simulation-based learning research tool called the scriptwriting task, in which pre-service teachers are asked to complete a script of a dialogue from a classroom simulation involving reasoning in the context of fraction multiplication and division, this research examines how pre-service teachers thereby assist students work through difficulties and help them in justifying their reasoning. This facilitates the investigation of pre-service teacher moves to support student reasoning that the pre-service teachers employ in their completion of the script or dialogue, considering their imagined actions and choice of words. Scripts from forty-one pre-service primary teachers were examined for the study and five clusters based on the teacher moves for supporting student reasoning utilized were formed. The pre-service mathematics teachers' scripts and the five clusters found during analysis are discussed with implications for future teacher education and the support of developing mathematical reasoning skills.

Misinformation is Contagious: Learning to Detect Misinformation Through an Online Game

Keywords: Comprehension of Text and Graphics, Game-based Learning, Lifelong Learning, Reasoning

Presenting Author:Sarit Barzilai, University of Haifa, Israel; **Co-Author:**Danna Tal-Savir, University of Haifa, Israel; **Co-Author:**Fayez Abed, University of Haifa, Faculty of Education, Israel; **Co-Author:**Shiri Mor-Hagani, University of Haifa, Israel; **Co-Author:**Na'ama Goldik, University of Haifa, Israel; **Co-Author:**Ohad Davidow, University of Haifa, Israel; **Co-Author:**Ina Talmon, University of Haifa, Israel

The Covid-19 pandemic has led to an online "infodemic" of misinformation. This study examined the efficacy of a game-based approach to teaching middle-school students about misinformation detection strategies. A misinformation game was designed in which players need to employ evaluation strategies in order to decide whether or not to share information about a pandemic on a social network. We examined the effect of playing the misinformation game on discernment between true and false Covid-19 information and on knowledge about misinformation detection strategies. Middle school students were randomly assigned to playing the misinformation game or to playing a control game about Covid-19 terms. Players of the misinformation game were better able to discern between true and false Covid-19 information in their sharing intentions and correctness judgments, in comparison to control group participants. Players of the misinformation game were also more aware of corroboration strategies and of the need to consult with knowledgeable others. These results suggest that online games can boost students' evaluation competence and can be part of an educational response to the challenge of widespread misinformation.

Exploring hypothetical question trajectories as support for guiding student questioning

Keywords: Design-based Research, Inquiry Learning, Primary Education, Teaching Approaches

Presenting Author:Harry Stokhof, HAN University of Applied Sciences, Netherlands; **Co-Author:**Helma Oolbekkink-Marchand, Radboud University, Department of Teacher education & HAN University of Applied Sciences, Netherlands

Student questions have multiple benefits for teaching and learning , but unfortunately many initial questions are unfocused, poorly investigable, and therefore difficult to answer. This study aims to understand how teachers can effectively guide student questioning to answers by researching the question: How do primary school teachers apply and perceive Hypothetical Learning Trajectories of questions, visualized as the Question Compass, as support for guiding student questioning? Using a design-based research strategy primary school teachers explored in design teams if and how the Question Compass could support them in guiding student questioning. The data collection resulted in 17 complete cases of design, implementation and evaluation. In the analysis the data was coded according to a) phases in the questioning process, b) patterns in teacher guidance of student questions in each phase, and c) specific activities based on the Question Compass in that phase. Teachers reported the Question Compass to be very effective for generating more diverse and more investigable questions. They also indicated that discussing questions with students significantly raised the quality of initial questions but also increased the likeliness of finding answers.

Session B 8

23 August 2021 12:00 - 13:00

Session Room 5

Single Paper

Learning and Special Education, Motivational, Social and Affective Processes

Motivation and Emotion in Primary Education

Keywords: Emotion and Affect, Learning Disabilities, Motivation and Emotion, Numeracy, Primary Education, Self-regulation, Student Learning

Interest group: SIG 08 - Motivation and Emotion, SIG 15 - Special Educational Needs

Chairperson: Mengsi Liu, The University of Tokyo, Japan

Reducing MA of school children: A systematic review of intervention research

Keywords: Emotion and Affect, Motivation and Emotion, Numeracy, Primary Education

Presenting Author:Miriam Balt, Leibniz Universität Hannover, Germany; **Co-Author:**Moritz Börnert-Ringleb, Leibniz University Hannover, Germany; **Co-Author:**Lars Orbach, Federal University of Minas Gerais, Brazil

Recent studies indicate that math anxiety (MA) can already be described in school-aged children. As early MA depicts a potential risk for developing severe mathematical difficulties and impedes the socio-emotional development of children, distinct knowledge about how to reduce MA of school-aged children is of particular importance. Therefore, this review aims at identifying the theoretical underpinnings, components and characteristics of existing MA interventions in school-aged children. Furthermore, we describe the effects of these interventions and the quality of the studies. After initial screening of 479 studies, 24 studies were identified that fulfilled our inclusion criteria. 58% of the studies investigated the effect of mathematical performance trainings on children's MA, whereas 38% applied some form of cognitive-behavioral training. The actual training activities in both approaches were diverse, ranging from training of calculation strategies, over numeracy musical training, to training of various coping techniques. 30% of the studies reported a positive effect of the intervention in the experimental condition compared to the control/ comparison condition. 38% of the studies found a positive effect of intervention on MA in both the experimental as well as the control/ comparison condition. The vast majority of the included studies used a quantitative study approach and most of the quantitative studies applied a pre-post design using a control group. The quality of the description of the study conditions, however, varied substantially. This heterogeneity in interventions and study quality indicates the need for more systematic research on MA intervention in children.

Triangulating measurements of student participation during class

Keywords: Motivation and Emotion, Primary Education, Self-regulation, Student Learning

Presenting Author:Charlotte Baez, Sankt Gallen University of Teacher Organisation, Switzerland; **Presenting Author:**Franziska Vogt, St.Gallen University of Teacher Education, Switzerland; **Co-Author:**Doris Kunz Heim, PH FHNW, Switzerland

Most educational scientists would agree that student participation is an important predictor of academic performance (Finn, Pannozzo, & Voelkl, 1995).

Nevertheless, a systematic empirical investigation of factors influencing student participation in primary school (Godwin et al., 2016) as well as a systematic comparison of different types of measures for student participation during class are missing. The aim of the study is to compare three different measures of student participation during class. Our sample includes 34 classes of fifth grade primary schools in Switzerland. Data is collected in different subjects taught by different teachers (German, English, Social and Natural Sciences as well as Arts and Crafts). Three different measures were collected, differing regarding timeframe (general, lesson) as well as perspectives (student, observer): a general student questionnaire, a standardized student observation in class, and a short student questionnaire after class. Results reported in this submission include N=1415 observations belonging to 585 students from 34 different primary school classes. The preliminary results show small to medium correlations between the three measures of student participation during class. Instruments sharing the same perspective (student) and method (questionnaire) correlated higher than instruments sharing the same timeframe (lesson). Instruments not sharing either perspective, method or timeframe showed the lowest correlations. A comparison of the correlation coefficients between the four subjects overall do not indicate systematic subject-specific differences.

Anxiety and reading self –concept of primary school children with learning disabilities

Keywords: Emotion and Affect, Learning Disabilities, Motivation and Emotion, Primary Education

Presenting Author:FOTINI POLYCHRONI, NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS, Greece; **Co-Author:**Alexander-Stamatis Antoniou, National & Kapodestrian University of Athens, Greece; **Co-Author:**Olga Kofa, National and Kapodistrian University of Athens, Greece

Learning disabilities are frequently associated with mental health, behavioural and social difficulties. The purpose of the present study is to compare the levels of anxiety and the reading self-concept in Greek students with Learning Disabilities (LD) as compared to their peers with no known disabilities. The sample consisted of 794 5th and 6th grade primary school children (51.3% boys and 48.7% girls) aged 10 to 12 years. Of the sample 56 students (7.1%) had a formal statement of LD by a state assessment centre. The State and Trait Anxiety Scale (Spielberger, 1989) and the Reading Self Concept Scale (Chapman & Tunmer, 1995) were administered to the students and information on school grades in language and math was collected. Results showed that students with LD reported higher anxiety levels, both A-Trait and A-State and lower reading self-concept, as compared to participants without LD. Children with higher grades in language and mathematics, reported lower state and trait anxiety and higher reading self-concept. A-State and A-Trait negatively predicted reading self-concept. Implications for early intervention and social emotional support for children with LD in the school settings in the form of primary and secondary prevention programmes are discussed.

Session B 9

23 August 2021 12:00 - 13:00

Session Room 9

Single Paper

Instructional Design, Teaching and Teacher Education

Pre-service Teacher Education

Keywords: Cognitive Skills, Educational Psychology, Learning Approaches, Mixed-method Research, Motivation and Emotion, Out-of-School Learning, Pre-service Teacher Education, Teaching/Instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Theresa Wilkes, Saarland University, Germany

Effects of sequencing and prompting on learning with contrastive video modelling examples

Keywords: Educational Psychology, Learning Approaches, Pre-service Teacher Education, Teaching/Instruction

Presenting Author:Theresa Wilkes, Saarland University, Germany; **Co-Author:**Lisa Stark, Saarland University, Germany; **Co-Author:**Kati Trempler, University of Wuppertal, Germany; **Co-Author:**Robin Stark, Saarland University, Germany

Especially for learning with functional (correct) and dysfunctional (erroneous) examples, reasonable sequencing of learning objects and providing adequate instructional support is crucial for successful learning. The present 2x2-intervention study ($N=220$) investigated effects of sequencing (dysfunctional-functional/functional-dysfunctional) and of prompting (with/without prompts) on learning with contrastive video modelling examples. Besides learning outcomes (i.e., concept knowledge, application knowledge), learning processes (i.e., written video analyses) were assessed. Results revealed that the order dysfunctional-functional led to higher application knowledge in the post-test. There was no effect of sequencing on concept knowledge. Groups with prompting showed both higher concept knowledge and application knowledge. Further, both the sequencing and the prompting effect resulted in deeper learning processes. Thus, learning with contrastive video modelling examples was most effective when the sequence 'dysfunctional-functional' was implemented and additional support in the form of prompts was provided.

Novice and expert teachers' noticing of classroom management events in two formats of instruction

Keywords: Cognitive Skills, Mixed-method Research, Pre-service Teacher Education, Teaching/Instruction

Presenting Author:Rebekka Stahnke, TU Dortmund University, Germany; **Co-Author:**Sigrid Blömeke, Centre for Educational Measurement (CEMO), Norway

Managing a classroom poses spontaneous and situated challenges for teacher that call for immediate action. Thus, noticing is a teacher skill that is particularly important for classroom management. However, there is no comprehensive research base on expert and novice teachers' situated noticing of classroom management events and how their noticing differs regarding formats of instruction. Therefore, this paper wants investigates novice and expert teachers' noticing of classroom management events in video clips of whole-group instruction and partner work. Eye movements and retrospective verbal analyses of 20 novices and 20 experts were compared. Regarding number and type of classroom management events noticed, experts noticed more events in a partner work activity than novices, particularly focusing on student-related events. In contrast, novices tended to notice more reactive teacher events in the whole-group instruction format than experts (and vice versa for partner work activities). Experts' visual attention was generally more focused on students while novices paid more attention to the teacher in the partner work activity. These results indicate differential expertise effects for the two formats of instruction that reflect the specific challenges posed to teachers.

Structure and predictors of instructional quality in private tutoring

Keywords: Motivation and Emotion, Out-of-School Learning, Pre-service Teacher Education, Teaching/Instruction

Presenting Author:Karin Guill, Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**A. Katharina Peters, no institutional affiliation, Germany; **Co-Author:**Janina Roloff-Bruchmann, IPN - Leibniz Institute for Science and Mathematics Education, Germany

Private tutoring is widespread although, based on empirical research, its general effectiveness is questionable. This might be due, among other things, to differences in the tutors' instructional quality. However, research on instructional quality of private tutoring is rare. Based on data from 402 German private tutors, we investigated the structure of instructional quality in private tutoring as well as the predictive validity of the tutors' enthusiasm as a central part of their professional competence and emotional exhaustion as an aspect of well-being. Confirmatory factor analyses confirmed the expected structure of instructional quality consisting of cognitive activation, classroom management, and student support. Latent regression analyses revealed enthusiasm and emotional exhaustion to significantly predict instructional quality of private tutoring. The findings suggest that research on instructional quality of private tutoring can connect to research on instructional quality in regular lessons and that it might be fruitful for tutoring companies as well as parents to search for tutors who are enthusiastic for teaching.

Session B 10

23 August 2021 12:00 - 13:00

Session Room 12

Workshop

Culture, Morality, Religion and Education

Bringing Thiagi to the classroom: Reducing stereotype-threat by promoting reflection in CRT

Keywords: Attitudes and Beliefs, Cultural Diversity in School, Teacher Professional Development, Teaching Approaches

Interest group: SIG 21 - Learning and Teaching in Culturally Diverse Settings

Culture and ethnicity influence how a person learns and views the world. Experiences at home influence students' learning fundamentally. However, cultural diversity in classrooms as well as issues such as stereotypes and biases have yet to be addressed in the German education system. School materials i.e., do many times not reflect the cultural diversity in modern classrooms, portraying and promoting stereotypes and biases. These (unconscious) biases are at the center of the problem and have yet to gain the attention and importance they deserve. Since stereotypes and biases are learned constructs, it is of utmost

importance to provide tools to unlearn/relearn incorrect constructs and form new synapsis. The existing challenges have thus far failed to be addressed by generic teaching techniques and pedagogy. A new strategy and teaching approach in education is needed to address these issues in an attempt to reduce the current achievement gaps across students of different cultural backgrounds and to incorporate experiences of all students in classroom interactions. In this workshop, we will introduce an interactive teaching and learning approach to promote reflection in culturally responsive teaching (CRT). The instructional design method of Thiagi will serve as an innovative tool to successfully implement CRT, raise awareness of existing stereotypes/ (unconscious) biases, and thus model a way to reduce stereotype-threat. By integrating diversity in form of CRT in the curriculum, we can fundamentally change existing patterns and enable every student to understand and connect to academic content.

Bringing Thiagi to the classroom: Reducing stereotype-threat by promoting reflection in CRT

Presenting Author:Tabea Berberena, University of Stuttgart, Germany; **Presenting Author:**Maria Wirzberger, University of Stuttgart, Germany

Culture and ethnicity influence how a person learns and views the world. Experiences at home influence students' learning fundamentally. However, cultural diversity in classrooms as well as issues such as stereotypes and biases have yet to be addressed in the German education system. School materials i.e., do many times not reflect the cultural diversity in modern classrooms, portraying and promoting stereotypes and biases. These (unconscious) biases are at the center of the problem and have yet to gain the attention and importance they deserve. Since stereotypes and biases are learned constructs, it is of utmost importance to provide tools to unlearn/relearn incorrect constructs and form new synapsis. The existing challenges have thus far failed to be addressed by generic teaching techniques and pedagogy. A new strategy and teaching approach in education is needed to address these issues in an attempt to reduce the current achievement gaps across students of different cultural backgrounds and to incorporate experiences of all students in classroom interactions. In this workshop, we will introduce an interactive teaching and learning approach to promote reflection in culturally responsive teaching (CRT). The instructional design method of Thiagi will serve as an innovative tool to successfully implement CRT, raise awareness of existing stereotypes/ (unconscious) biases, and thus model a way to reduce stereotype-threat. By integrating diversity in form of CRT in the curriculum, we can fundamentally change existing patterns and enable every student to understand and connect to academic content.

Session B 11

23 August 2021 12:00 - 13:00

Session Room 17

Workshop

Developmental Aspects of Instruction

Active learner participation in the co-creation of education: Challenges, approaches and tips

Keywords: Instructional Design, Synergies between Learning; Teaching and Research, Teacher Professional Development, Teaching Approaches

Interest group: SIG 13 - Moral and Democratic Education

Active involvement of learners in the design of education contributes to improvement of educational quality and enhances feelings of engagement, agency, and empowerment. There is growing attention to co-creation of education both in educational practice and research, as it contributes to sustainable education and increased commitment of all involved stakeholders. In this workshop, participants will learn about the implementation of co-creation in practice. After a short presentation on the definition of co-creation and its potential impact, there will be an interactive discussion about challenges that might be encountered by the different stakeholder groups, including learners, teachers, and educational institutions. Awareness of potential challenges can help to develop solutions to overcome them. In a group assignment, participants will develop plans for co-creation of a course or part of a curriculum. This will be facilitated by an online form with guiding questions that structure the discussion in the break-out rooms. After a large group debrief of the assignments, an evidence-based checklist will be presented that will be used to evaluate the developed co-creation plans. Lessons learned by the participants are exchanged and we will add insights from our recent literature study to provide participants with tips on how to put co-creation in practice. This workshop will be highly interactive and uses polls, chat assignments, break out rooms, and plenary discussions.

Active learner participation in the co-creation of education: Challenges, approaches and tips

Presenting Author:Karen Könings, Maastricht University, Netherlands; **Co-Author:**Shireen Suliman, Hamad Medical Corporation, Qatar; **Co-Author:**Raghda Al-Bualy, Oman Medical Specialty Board, Oman; **Co-Author:**Subha Ramani, Brigham and Women's Hospital, Harvard Medical School; Harvard Macy Institute, United States

Active involvement of learners in the design of education contributes to improvement of educational quality and enhances feelings of engagement, agency, and empowerment. There is growing attention to co-creation of education both in educational practice and research, as it contributes to sustainable education and increased commitment of all involved stakeholders. In this workshop, participants will learn about the implementation of co-creation in practice. After a short presentation on the definition of co-creation and its potential impact, there will be an interactive discussion about challenges that might be encountered by the different stakeholder groups, including learners, teachers, and educational institutions. Awareness of potential challenges can help to develop solutions to overcome them. In a group assignment, participants will develop plans for co-creation of a course or part of a curriculum. This will be facilitated by an online form with guiding questions that structure the discussion in the break-out rooms. After a large group debrief of the assignments, an evidence-based checklist will be presented that will be used to evaluate the developed co-creation plans. Lessons learned by the participants are exchanged and we will add insights from our recent literature study to provide participants with tips on how to put co-creation in practice. This workshop will be highly interactive and uses polls, chat assignments, break out rooms, and plenary discussions.

Session B 12

23 August 2021 12:00 - 13:00

Session Room 11

Espresso Invited Symposium

SIG 2: Beyond mere content: contextual and metatextual aspects in multiple document comprehension

Keywords: Comprehension of Text and Graphics, E-Learning/Online Learning, Literacy, Reading Comprehension

Interest group: SIG 02 - Comprehension of Text and Graphics

Chairperson: Yvonne Kammerer, Knowledge Media Research Center, Germany

Chairperson: Cornelia Schoor, University of Bamberg, Germany

Organiser: Cornelia Schoor, University of Bamberg, Germany

Organiser: Yvonne Kammerer, Knowledge Media Research Center, Germany

Discussant: Mônica Macedo-Rouet, France

In the field of multiple document comprehension (MDC), recent theorizing (RESOLV model: Rouet et al., 2017) suggests that context shapes readers' internal representations of the reading situation and task. These representations, in turn, are assumed to influence reading decisions, behaviors, and outcomes. Yet, research on context effects on MDC is still scarce. The present symposium contributes to advancing our theoretical and empirical knowledge about aspects of MDC that go beyond the mere content of documents. It combines four contributions addressing metatextual, contextual, and individual aspects of MDC. The first contribution analyzes micro-level source characteristics (e.g., publication venue, author expertise), as a metatextual feature. It investigates whether secondary-school students' evaluation of these source characteristics can be predicted by time on task and the individual difference factors, prior knowledge and epistemic beliefs. The second contribution focuses on the disciplinary perspective of documents, that is a macro-level source characteristic, as a metatextual feature. The study analyzes university students' ability to identify and evaluate the domain perspective of multiple documents (e.g., discipline of marketing vs. psychology),

and whether this relates to students' integration of multiple perspectives. In the third contribution, stakes (high vs. low) were manipulated. The study shows that this contextual factor influences essay writing based on multiple documents. In the fourth contribution, both the macro-context and the consistency of texts was manipulated and related to behavior, essay writing, and memory.

Rouet, J.-F., Britt, M. A., & Durik, A. M. (2017). RESOLV: Readers' representation of reading contexts and tasks *Educational Psychologist*, 52(3), 200-215.

Upper Secondary School Students as Critical Online Readers

Presenting Author:Carita Killi, Tampere University, Finland; **Co-Author:**Ivar Braten, University of Oslo, Norway; **Co-Author:**Helge Stromso, University of Oslo, Norway; **Co-Author:**Michelle Schira Hagerman, University of Ottawa, Canada; **Co-Author:**Anne Jyrkiäinen, Tampere University, Finland; **Co-Author:**Eija Räikkönen, University of Jyväskylä, Finland

We examined how upper secondary school students ($N = 73$; aged 16 to 17) evaluated author expertise, author intention, the publication venue, and the quality of evidence when reading four texts about the effects of sugar consumption in a web-based environment. Additionally, we examined how students' prior topic knowledge, Internet-specific justification beliefs, and time on task were associated with their credibility judgments. Students rated author expertise, author intention, the venue, and the quality of evidence for each text on a six-point scale and provided written justifications for their ratings. Their credibility judgments (16 written responses altogether) were awarded 0–3 points each, forming the basis of a sum variable termed Credibility Judgments. While students' ratings were quite accurate, their credibility judgments lacked sophistication. Inter-individual differences were considerable, however. Regression analysis revealed that time on task was a statistically significant unique predictor of students' credibility judgments. Instructional implications will be shared in the presentation.

Students' Reasoning About Domain Perspectives When Learning from Multiple Texts

Presenting Author:Alexandra List, The Pennsylvania State University, United States; **Co-Author:**Hongcui Du, The Pennsylvania State University, United States; **Co-Author:**Bailing Lyu, The Pennsylvania State University, United States

This exploratory study represents an initial investigation of domain perspective learning (DPL). Domain perspective learning refers to students' reasoning about information from varied domain perspectives (i.e., recognizable areas of study, marked by distinct epistemologies) when trying to understand complex, real-world issues. Students were presented with four different domain perspectives (e.g., urban planning, marketing) on societal factors contributing to high rates of obesity in the United States (e.g., unsafe neighborhoods, food advertising). Students' identification of various domain perspectives, domain perspective evaluation, and domain perspective integration were examined. While students were found to be fairly adept at domain perspective identification, their integration of varied domain perspectives was more limited. Both identification and evaluation were associated with domain perspective integration.

Performing a high and low-stakes integration task: Effects on essay completion and perceived effort

Presenting Author:Raquel Cerdan, University of Valencia, Spain; **Co-Author:**Ignacio Mañez, University of Valencia, Spain; **Co-Author:**Tobias Richter, University of Würzburg, Germany

In this proposal, we analyze how the manipulation of the consequences of performance (high vs. low-stakes) impacts performance and perceived effort when reading multiple controversial texts and writing an essay. Forty-one undergraduate students participated in the study. They read four conflicting texts on the topic of homework and wrote an essay with the texts available. A high-stakes condition made students' perform better in the essay (higher number of ideas) and include more references to sources. Moreover, students reported a higher level of perceived effort in integrating ideas. In sum, high-stakes contextual situations may boost students' awareness of the demands of complex learning tasks, such as integrating information from multiple conflicting texts. Future research should analyze the impact of contextual manipulations on reading behaviors by means of on-line measures and considering learners' individual differences.

Context and consistency effects when reading multiple documents

Presenting Author:Cornelia Schoor, University of Bamberg, Germany; **Co-Author:**Jean-François Rouet, University of Poitiers, France; **Co-Author:**MaryAnne Britt, Northern Illinois University, United States

University students might read multiple documents in various contexts, such as a university assignment or a personal need. Comprehending multiple documents often involves dealing with inconsistent or conflicting information. Research has evidenced that (in)consistency increases readers' attention to and memory of source information. Less well-researched is the potential effect of the reading context on readers' attention to who says what. Moreover, readers may approach textual inconsistencies in different ways depending on their perception of contextual demands. In the present study, 160 university students read two short texts on 8 topics, in 4 of which consistent or inconsistent, respectively, information was presented, and wrote an essay on each topic. For half of the participants reading was set in a university scenario, whereas the other half received a personal scenario. Time on texts, on the task page, re-accessing the texts and text switches were recorded in logfiles. In addition, participants' essays were coded with regard to formal characteristics, and dealing with source information and conflicts. In a posttest, their memory of the texts, sources, and conflicts was assessed. We found consistency effects in most behavioral measures, in source citation in the essays, and in memory for text and sources. Additionally, we found context effects on most behavioral measures and on communication aspects of the essay, but not on memory. There was only one interaction of context and consistency, namely regarding whether there was a source evaluation in the essay. Results are discussed with regard to the RESOLV model of purposeful reading.

Session B 13

23 August 2021 12:00 - 13:00

Session Room 2

Collaborative Workspace

Assessment and Evaluation

Preservice and novice language teachers' development of summative assessment literacy

Keywords: Assessment Methods and Tools, Case Studies, Language (Foreign and Second), Pre-service Teacher Education

Interest group: SIG 01 - Assessment and Evaluation

The purpose of this collaborative workspace is twofold: (1) introduce an ongoing research project on pre-service and novice language teachers' development of summative assessment literacy funded by the Swedish Research Council (2019-21), and (2) discuss the preliminary results within the context of previous research and relevant theoretical models in order to establish a broader research collaboration for studying the development of summative assessment literacy through pre-service teacher education. There are different approaches to developing summative assessment literacy such as "assessment for learning" and "assessment of learning," and it is critical to analyze the impact of these approaches and the respective learning opportunities (courses, seminars, practices, etc.) on pre-service teachers' development of summative assessment literacy.

Preservice and novice language teachers' development of summative assessment literacy

Presenting Author:Ali Yıldırım, University of Gothenburg, Sweden; **Co-Author:**Birgitta Fröjdendahl, Department of Language Education, Stockholm University, Sweden; **Co-Author:**Anne Dragemark Oscarson, University of Gothenburg, Sweden; **Co-Author:**Raili Hilden, University of Helsinki, Finland

The purpose of this collaborative workspace is twofold: (1) introduce an ongoing research project on pre-service and novice language teachers' development of summative assessment literacy funded by the Swedish Research Council (2019-21), and (2) discuss the preliminary results within the context of previous research and relevant theoretical models in order to establish a broader research collaboration for studying the development of summative assessment literacy through pre-service teacher education. There are different approaches to developing summative assessment literacy such as "assessment for learning" and "assessment of learning," and it is critical to analyze the impact of these approaches and the respective learning opportunities (courses, seminars, practices, etc.) on pre-service teachers' development of summative assessment literacy.

Session B 14

23 August 2021 12:00 - 13:00

Session Room 16

Roundtable

Cognitive Science, Lifelong Learning

Citizenship Education

Keywords: Citizenship Education, Communities of Practice, Competencies, Conceptual Change, Learning Technologies, Lifelong Learning, Misconceptions, Qualitative Methods, Social Sciences, Teacher Professional Development

Interest group: SIG 03 - Conceptual Change, SIG 13 - Moral and Democratic Education

Chairperson: Frederik Damerau, Germany

Intertwining Competence in Journalism and Democracy. An Interdisciplinary Approach to a New Model

Keywords: Citizenship Education, Competencies, Qualitative Methods, Teacher Professional Development

Presenting Author: Frederik Damerau, Center for Journalism and Democracy at Leipzig University, Germany; **Co-Author:** Christopher Pollak, Center for Journalism and Democracy at Leipzig University, Germany; **Co-Author:** Juliane Pfeiffer, Center for Journalism and Democracy at Leipzig University, Germany

Researchers in communication studies and political science are currently developing a model which intertwines competence in journalism and competence in democracy – drawing on the assumption that the overlaps of existing concepts of both competences are quite evident and these concepts presuppose each other. While François Audigier's internationally acknowledged competence model for education for democratic citizenship provides a solid basis for this aim, a theoretical framework for competence in journalism has yet to be established. This is to be achieved by advancing the German theorem of media competence and by meeting the requirements of educational research while also taking concepts for the education and training of journalists into account. The modelling will then be carried out in a two-step qualitative process by conducting content analysis firstly and expert interviews secondly. The new competence model is then operationalized in order to finally develop a measuring instrument that can be applied in the field of teacher training and political education. With this research program, an adequate approach is to be offered meeting today's challenges of divided democratic societies in the era of digitalization and globalization.

Community organizing and political active citizens: contradictions and dilemmas

Keywords: Citizenship Education, Communities of Practice, Learning Technologies, Lifelong Learning

Presenting Author: Juana Sarmiento Jaramillo, Université de Genève, Switzerland

The author presents the preliminary results of a research centered on a French community organization and discusses the organizers learning and development processes and the possible advantages of video narratives for training purposes. Usually conceived as having an important educative role for the promotion of sustainable and just societies through citizens emancipation, the community organizing contradictory aspects can nevertheless question its educational potential. Conducted within the theoretical and methodological framework of course-of-action, two kind of data in order to analyze the organizers activity were collected, processed and analyzed: audiovisual recording of organizers' real selected work situations and verbalization during interviews of self-confrontation. Typical-episodes (i.e. situations representing dilemmas) were identified and video narratives addressing dilemmas were created. We discuss the use of video narratives, as well as the content selection, editing principles and viewing conditions for training purposes. We review the relevance of addressing dilemmas as well as of the different ways in which they are solved by the organizers in their daily work life, and how this could enrich community organizers learning and development processes and enhance citizens agency.

Young Adults' Intuitive Conceptions of the Pension System in Germany: An Interview Study

Keywords: Citizenship Education, Conceptual Change, Misconceptions, Social Sciences

Presenting Author: Ronja Baginski, University of Mannheim, Germany; **Co-Author:** Julia Schultheis, University of Mannheim, Germany; **Co-Author:** Carmela Aprea, University of Mannheim, Germany

The responsibility to take care of one's own old-age provision rises in many countries due to different developments such as the demographic change and the retraction of the state from the social security systems. This holds especially for today's young adults who are, however, often unaware of this necessity. This unawareness and possible remedies to overcome it may also depend on how young adults conceive the pension system. In addition, the pension system is a concern of constant social policy reforms, which citizens judge as they vote. Their intuitive conceptions are thus of vital concern for citizenship education. In this paper, we present a study that aims at exploring young adults' intuitive conceptions of the German pension system. To this end, semi-structured interviews with 108 undergraduate students of economic and business education were conducted and assessed by means of content analysis. Preliminary results indicate diverse intuitive conceptions of the German pension system and point towards information needs and further research. The study contributes to the growing but still poorly researched area of research on conceptions and conceptual change in economics (theoretical significance). In addition, it provides indications for learning needs, which are imperative to design respective learning arrangements (practical significance).

Session B 15

23 August 2021 12:00 - 13:00

Session Room 15

Invited Symposium

Learning and Social Interaction, Teaching and Teacher Education

Advances in Mixed-Methods Social Network Analysis (EFG on MMSNA)

Keywords: Ethnography, Mixed-method Research, Qualitative Methods, Quantitative Methods, Social Aspects of Learning and Teaching, Social Interaction, Social Sciences

Interest group: SIG 17 - Methods in Learning Research

Chairperson: Alla Hemi, Bar Ilan University, Israel

Organiser: Dominik E. Froehlich, University of Vienna, Austria

Discussant: Laura Monique Thomas, Ghent University, Belgium

Both mixed methods (MM) and social network analysis (SNA) are important trends in research about learning and instruction. Combining both in what we call mixed methods social network analysis (MMSNA) holds the promise of being exceptionally well suited to answer the complex questions of the field. While MM allows investigating phenomena through different lenses, SNA recognizes the interdependencies between people that moderate learning. This is the invited symposium of the EARLI Emerging Field Group (EFG) focused on Mixed Methods Social Network Analysis in Learning and Instruction. In this symposium, three papers of members of this EFG will be presented. They give an overview over the current topics in MMSNA and showcase what we are discussing in the EFG. If you want to learn more about this EFG, please feel free to join us and the discussion at <https://group.mmsna.eu/>

Exploring Online Social Networks of Educational Leaders in Times of COVID-19

Presenting Author: Martin Rehm, Pädagogische Hochschule Weingarten, Germany

The COVID-19 pandemic has raised a wide range of questions and challenges for school leaders that they now (rapidly) have to address. Consequently, a growing number of school leaders have turned to their (informal) social networks, in order to collect information, reach out to their communities and share experiences. The current study investigates two main questions: i) how educational leaders access and exchange information through online social networks, ii) how information on and around the COVID-19 pandemic is traceable in these networks. In this context, we collected over 120.000 Tweets from 15 US-based hashtags. Using a mixed-methods approach, we discovered several key structural dimensions, a host of highly influential actors, and semantic evidence for users sharing and diffusing information on topics such as "inspirational quotes" and showcasing practical experiences. These findings are valuable for policy makers and educational leaders alike, as they map the underlying communication patterns and provide valuable insights into who is moving what types of

resources as part of the emerging governance approach on social media.

Ethnographic MMSNA: linking actor agency, social structure, and the 'thingness' of networks

Presenting Author:Marc Sarazin, University of Edinburgh, United Kingdom; **Co-Author:**Natasa Pantic, University of Edinburgh, United Kingdom

Ethnographic methods offer unparalleled opportunities to capture aspects of social reality that routinely elude quantitative social network analysis (SNA) research. Quantitative SNA may give us powerful tools to uncover the contributions of networks to social structure, and the pervasiveness of networks. However, on its own, quantitative SNA fails to grasp how individuals deploy their agency to creatively shape social structure, or how individual actors perceive and experience their networks. In short, quantitative SNA renders an incomplete account of the pragmatic consequences of social networks—of how networks concretely link people together so as to become tangible ‘things’ that matter for actors.

Ethnographic methods can fill these gaps: they give rich, detailed information on actor agency, and on how actors perceive and experience the many ties in which they are embedded. Yet, despite the historical overlap with ethnographic research, few SNA research designs deploy ethnographic methods. The present paper will expound on the benefits and challenges of integrating ethnographic and quantitative SNA methods in a research project that does deploy ethnographic mixed methods SNA—the Teaching that Matters for Migrant Students (TEAMS) project. TEAMS combines multi-sited ethnography, social network surveys, and on-line reflective logs for staff members in six schools in Scotland, Sweden, and Finland. The paper will discuss the unique opportunities afforded by the study’s research design, as well as the difficulties that the design entailed and how these were averted or overcome. To bring out these points, the paper will briefly discuss the project’s research on the effects of the COVID-19 pandemic on teacher collaboration, and on the influence of social networks on teachers’ abilities to integrate migrant students.

Is social network analysis inherently mixed and multilevel?

Presenting Author:Victoria Murphy, Open University, United Kingdom

Social network analysis (SNA) is an increasingly important tool for investigating relationships and their impact on education. Several researchers have made the case for SNA as an inherently mixed method, due to the unique types of data and visualizations that are central to SNA. However, as SNA studies collect data about individuals which is often aggregated to different levels of networks (such as classes within schools within districts), is SNA also inherently multilevel? A multilevel mixed methods (MLMM) design collects qualitative and quantitative data about different levels of a system, integrating data to gain a holistic understanding. Network-level SNA usually aggregates data about individuals to understand the structure and function of a whole network, meeting part of that MLMM definition. Social network theories help researchers interpret their SNA findings, which may be combined with other theories to create a comprehensive framework. When this theoretical framing includes a multilevel perspective, network-level SNA meets the criteria for to be called a MLMM study. This presentation will discuss the potential benefits of incorporating guidelines published by Headley and Plano Clark (2020) on MLMM research into the design and reporting of MLMM SNA. The session will finish by presenting a recent study to demonstrate how the guidelines on multilevel mixed methods research can help to bring clarity and transparency to complex SNA designs.

Case Comparison Tables in SNA

Presenting Author:Dominik E. Froehlich, University of Vienna, Austria

In this presentation, we marry (a) the idea of dealing with social networks as individual cases and (b) the method of case comparison tables. The objective of this presentation is to explore the potential that the usage of case comparison tables holds to investigate social networks. For that purpose, we first further develop the argument that the “caseness” of networks can be adequately dealt with with (a variant of) CCTs. To further elaborate on this method we then provide an example of how CCTs have been used to make sense of networks of research methods (this example is a methodological review in the field of mindfulness research).

Session C 1

23 August 2021 14:30 - 15:30

Session Room 2

Single Paper

Learning and Social Interaction

Attitudes, Beliefs and Social Interaction

Keywords: Attitudes and Beliefs, Educational Psychology, Social Aspects of Learning and Teaching, Social Interaction

Interest group: SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Marc Sarazin, University of Edinburgh, United Kingdom

Teacher expectations and emotions concerning students with special needs or immigrant background

Keywords: Attitudes and Beliefs, Educational Psychology, Social Aspects of Learning and Teaching, Social Interaction

Presenting Author:Ineke Pit-ten Cate, University of Luxembourg, Luxembourg; **Co-Author:**Mireille Krischler, Universität Trier, Germany

Teachers are faced with increasingly heterogeneous student groups, whereby the successful inclusion of all students largely depends on teachers’ competence and attitudes. Attitudes are understood as a multifaceted construct with cognitive, affective and conative components. In the current study we investigated to what extent teachers’ expectations concerning students’ academic performance - reflecting the cognitive component of attitudes - varied as a function of specific student characteristics (special educational needs and immigrant background). In addition, we assessed teachers’ emotions - reflecting the affective component of attitudes - concerning the inclusion of these students in mainstream education. Result confirmed previous findings that teachers’ expectations and emotions vary as a function of student characteristics. Teachers had lower expectations of the academic performance of students with learning difficulties than students with challenging behavior, whereby the estimates of German proficiency were also affected by the immigrant background of the student. Teachers felt however less positive about the inclusion of students with challenging behavior than of students with learning difficulties, regardless of the immigrant background of the student. Results will be discussed in relation to theory and their practical implications.

Effects of negative stereotypes on performance and social relations of immigrant students

Keywords: Attitudes and Beliefs, Educational Psychology, Social Aspects of Learning and Teaching, Social Interaction

Presenting Author:Sarah E. Martiny, UiT The Arctic University of Norway, Norway; **Co-Author:**Laura Froehlich, FernUniversität in Hagen, Germany

Negative stereotypes about immigrants are widespread in Germany. Psychological research has shown that negative competence-related stereotypes cannot only lead to prejudice and discriminatory behavior on the part of other people, but stereotypes can also negatively influence the behavior of those targeted by the stereotypes. So far, little is known about the effects of negative stereotypes on the performance and social relations of people with a migration background in Germany. Therefore, first, we examined the existence of negative competence-related stereotypes among students trained as teachers in Germany. We show that negative stereotypes about people with a Turkish migration background are particularly widespread and that these negative stereotypes go along with internal attributions of failure. In a second step, we show that negative competence-related stereotypes can lead to reduced performance for adolescents with Turkish migration background. Furthermore, we investigated factors that moderate this effect. We provide evidence for the moderating role of naive intelligence theories and collectivism. Subsequently, a meta-analysis is presented that finds a small, non-significant main effect of stereotype activation and a significant, medium-sized moderated effect. Finally, we broaden the perspective and investigate the effect of negative stereotypes on social relations. We provide evidence that facing negative stereotypes in educational settings can decrease immigrant students’ sense of belonging and this in turn decreases their social approach motivation. We discuss possible measures to reduce the effects of negative stereotypes in the German school system and explore existing gaps in research.

Effects of stereotype threat in learning situations for students with migration background

Keywords: Attitudes and Beliefs, Educational Psychology, Social Aspects of Learning and Teaching, Social Interaction

Presenting Author:Sabrina König, TU Dortmund University, Germany; **Co-Author:**Justine Stang, TU Dortmund University, Germany; **Co-Author:**Bettina Hannover, Freie Universität Berlin, Germany; **Co-Author:**Lysann Zander, Leibniz Universität Hannover, Germany; **Co-Author:**Oliver T. Wolf, Ruhr-Universität Bochum, Germany; **Co-Author:**Nele McElvany, TU Dortmund University, Germany

Due to worldwide migration movements, classrooms are heterogeneous. Large-scale assessments showed differences in achievement based on ethnicity: Compared to natives, students with migration background performed lower for example in the vocabulary domain, which is an important prerequisite for educational success. One explanation for achievement-related differences are stereotype threat (ST) effects. Compared to ST in achievement situations, in which ST leads to underachievement although cognitive abilities are similar, ST effects in learning situations are less researched. Therefore, this study investigated the role of ST-effects in vocabulary learning situations. Students' identification with country of residence or origin (ICR/O), identification with reading domain (IDR) and stress (measured by salivary cortisol) were examined as possible moderators of ST effects. Until now, 77 of 360 targeted ninth-grade students with migration background from secondary schools in Germany participated. In a pre-post design, students were assigned randomly to one of four treatment groups (implicit ST, explicit ST, explicit ST with removal before posttest, control group) and worked on vocabulary pre- and posttest in order to test ST in learning situations. In the learning unit, between pre- and posttest, children had to learn difficult German words from a narrative text and dictionary entries. Repeated measures ANOVAs revealed no ST effects in learning situations. Furthermore, ST was not moderated by ICR/O or IDR. Cortisol levels are not analyzed yet. Results are discussed in terms of content and methodological issues. Implications for further research are derived.

Session C 2

23 August 2021 14:30 - 15:30

Session Room 12

Single Paper

Learning and Social Interaction, Teaching and Teacher Education

Teacher Professional Development and Workplace Learning

Keywords: Collaborative Learning, Informal Learning, Pre-service Teacher Education, Qualitative Methods, Secondary Education, Teacher Professional Development, Workplace Learning

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Thomas Martens, Medical School Hamburg, Germany

Innovative professional potential in the interaction between newly-qualified teachers and schools

Keywords: Qualitative Methods, Secondary Education, Teacher Professional Development, Workplace Learning

Presenting Author:Julia van Leeuwen, Radboud Teachers Academy, Radboud University Nijmegen, Netherlands; **Co-Author:**Harmen Schaap, Radboud University Nijmegen, Netherlands; **Co-Author:**Femke Geijsel, Radboud University Nijmegen, Netherlands; **Co-Author:**Paulien Meijer, Radboud University Nijmegen, Netherlands

Newly-qualified teachers (NQT's) enter the school with a fresh pair of eyes and new, creative ideas that could foster pupil learning and school improvement. This potential can be understood as innovative professional potential, manifesting in the interaction between NQTs and schools. Although schools do see that NQT's could potentially contribute to the school, they often do not make use of this potential. To be able to value and use the potential of NQT's in the school, it is necessary to understand what this potential entails and how it can manifest in the interaction between NQT's and their schools. The current research aimed to provide this understanding, by focusing on the content and nature of experiences related to innovative professional potential. Content concerns what the experience is about and nature concerns how the experience came to happen and what was or who were involved. Timeline interviews with 19 NQT's in secondary education were held. Findings show that the contents of experiences mainly are activities outside the classroom, focusing either directly on pupils and education (e.g. coordinating the care for children with dyslexia) or on policy (e.g. participating in a working group on the test structure of the school). In the nature of these experiences the importance of processes of claiming and granting becomes visible. Especially the way closer colleagues do or do not grant space for NQT's ideas or intended activities, appears to inform whether NQT's felt able to contribute at all and felt valued for their contributions.

Towards creating an expansive learning environment for pre-service teachers

Keywords: Informal Learning, Pre-service Teacher Education, Teacher Professional Development, Workplace Learning

Presenting Author:Adeline Yuen Sze Goh, Universiti Brunei Darussalam, Brunei Darussalam; **Co-Author:**Desmond Chia Chun Tan, Universiti Brunei Darussalam, Brunei Darussalam

Research on work-based learning has shown that the workplace could be a legitimate site for learning, especially for newcomers. Many studies have shown that newcomers learn through participation in work activities. These activities provide the learning opportunities to learn to become a part of the community. The aim of this paper is to explore these learning opportunities in school subject departments for pre-service teachers when participating in a 18-month initial teacher training programme in Brunei. The paper uses Fuller and Unwin's (2003) expansive and restrictive framework to facilitate a greater understanding of the learning opportunities of the pre-service teachers in their school placements. Based on data collected through interviews with these teachers, we identified differing learning opportunities afforded in these school placements. The findings also set out some salient features of expansive and restrictive environments for pre-service teachers in their teaching placements. Discussion centres around the access to school-based mentors whose role is paramount to their learning. The conclusions of our study are useful for understanding the ways in which individual pre-service teachers exercised agency, and to highlight the importance of wider institutional structures supporting workplace learning. It also elucidates the nature of learning environments, especially the disposition of mentors towards pre-service teachers learning. Recommendations are discussed to identify a number of ways to enhance learning opportunities in future school placements.

Exploring deep-level characteristics of student teacher collaboration in practicum

Keywords: Collaborative Learning, Pre-service Teacher Education, Teacher Professional Development, Workplace Learning

Presenting Author:Marco Galle, Zurich University of Teacher Education, Switzerland; **Co-Author:**Annelies Kreis, Zurich University of Teacher Education, Switzerland

Peer collaboration referring to teaching-related tasks is considered essential for teacher learning. Quantitative studies explored characteristics such as frequency of collaborative activities between different actors or content of interaction. From a socio-constructivist perspective, co-construction of meaning in dialogue is crucial for learning. To our knowledge, deep-level characteristics of collaborative processes between two (student) teachers have not yet been explored with large scale instruments. We define four crucial characteristics of collaborative processes: (1) mutual respect and equality, (2) mutual trust, (3) knowledge and experience connectivity, and (4) joint mastering of challenges. We analysed how 451 student teachers estimate these factors for their collaborative practice during a practicum. The questionnaire is reliable and valid (exploratory and confirmatory factor analysis). The student teachers report positive experiences regarding all four characteristics. This is promising for peer learning during practicum. Furthermore, good experiences with peer collaboration might result in enhanced openness for future collaboration.

Session C 3

23 August 2021 14:30 - 15:30

Session Room 3

Single Paper

Instructional Design, Lifelong Learning, Teaching and Teacher Education

Achievement

Keywords: Achievement, Arts, Higher Education, Instructional Design, Lifelong Learning, Quantitative Methods, Student Learning, Teaching/Instruction

Interest group: SIG 04 - Higher Education, SIG 14 - Learning and Professional Development, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Thorsten Scheiner, Australian Catholic University, Australia

Deeper learning in lectures: A comparison of generating questions vs. paper writing

Keywords: Achievement, Higher Education, Instructional Design, Student Learning

Presenting Author:Natalie Enders, Universität Hildesheim, Germany; **Co-Author:**Pamela Baess, University of Hildesheim, Germany

In the present study, two learning activities that are supposed to foster deeper understanding have been compared regarding their effectiveness for university students' academic success. The research questions are:Are the learning activities (equally) effective for improving students test results?

Do students' test results differ for reproduction of facts vs. application of knowledge and principles?

Do students' evaluations of the learning activities correspond with their tests results?In a randomized control trial, three learning activities were implemented in an instruction-based lecture:*Generating questions*: Students wrote questions and short answers about the content of the lecture*Paper writing*: Students wrote a paper about the most important content of the lecture and the pending questions they still might have. *Finger fitness exercises*: Students followed the instructions of a short video clip on finger fitness exercises (control condition). Students evaluated the effectiveness of each activity for their learning on a six item rating scale. Academic Achievement was measured through an exam (closed questions) in which the cognitive processes of *remembering/understanding* and *application* were targeted in equal parts.Across seven lectures, the mean attendance was 160 ($SD=9$) students. First data analysis show that the average of scored points differed significantly for remembering/understanding vs. application, $t(142)=23.99, p$

Instructional quality: validity, comparability and the relationship to student outcomes.

Keywords: Achievement, Quantitative Methods, Student Learning, Teaching/Instruction

Presenting Author:Bas Senden, ILS, University of Oslo, Norway; **Co-Author:**Trude Nilsen, University of Oslo, Norway; **Co-Author:**Nani Teig, University of Oslo, Norway

This article examines student ratings of instructional quality by focusing on the factorial structure, comparability across grades, and contribution to student outcomes. Prior research has increasingly supported, and used, student ratings as a measure of instructional quality (e.g. De Jong & Westerhof, 2001; Fauth, Decristan, Rieser, Klieme, & Büttner, 2014). This use has also emphasized in the Trend in Mathematics and Science Study (TIMSS) 2019, where a renewed focus on instructional quality contributed to new and updated items (Mullis & Martin, 2017). In addition, Norway added a number of national items to measure instructional quality, providing a novel opportunity to investigate student ratings of instructional quality across grades (Grades 5 vs. 9) and subjects (mathematics vs. science) using a representative sample of students. The sample consist of 3951 fifth grade and 4575 ninth grade students, both divided over 231 classes. Results from multilevel confirmatory factor analysis indicates a three-dimensional factor structure, which aligns with previous research describing instructional quality as having three basic dimensions: classroom management, supportive climate, and cognitive activation. Regarding the comparability of instructional quality, two-level measurement invariance analysis confirms its factor structure to be scalar invariant across grades and subjects. Last, all three dimensions of instructional quality are positively related to student achievement in mathematics in Grade 9. The remaining result—i.e., the relationship between instructional quality and science achievement in Grade 5—will be ready in time for the conference. We discuss the implications of these findings in improving the assessment of instructional quality.

Acquiring the Art of Conducting: Deliberate Practice as Part of Professional Learning

Keywords: Achievement, Arts, Higher Education, Lifelong Learning

Presenting Author:Simon Schmidt, Universität Regensburg, Germany; **Co-Author:**Manuel Laengler, University of Regensburg, Germany; **Co-Author:**Hans Gruber, University of Regensburg, Germany

Conducting is a domain in which many students already achieved an expert level in related domains, in particular in instrumental playing. Different practice activities during their studies might be related to and making use of those prior experiences. It has not been examined yet, which prior activities conducting students performed before the beginning of their studies and how they value amount and effort of practice activities during their studies. This study aims to investigate these issues. Twenty-seven students of Orchestra Conducting at German music universities (which totals about 18.7% of the population) took part in a questionnaire study. An exploratory analysis investigate their study experience, pre-study experiences (instrumental, conducting) and amount and effort of practice activities during their studies. Results show that orchestral conducting students have substantial musical experience before commencing their studies. While conducting-specific practice activities gain a lot of dedication, score reading seems to play a tremendous and increasing role in studying orchestra conduction. Groups of pre-study and study experiences showed some differences in amount and effort of conducting-specific activities as well on general music practice activities. However, a systematic influence cannot be derived and may constitute future research desiderata.

Session C 4

23 August 2021 14:30 - 15:30

Session Room 11

Single Paper

Higher Education, Learning and Social Interaction, Lifelong Learning

Communities of Practice

Keywords: Action Research, Case Studies, Collaborative Learning, Communities of Practice, Higher Education, Lifelong Learning, Qualitative Methods, Quantitative Methods

Interest group: SIG 04 - Higher Education

Chairperson: Martin Rehm, Pädagogische Hochschule Weingarten, Germany

(De)institutionalizing informal social support? A case study on child protection

Keywords: Action Research, Case Studies, Collaborative Learning, Communities of Practice

Presenting Author:Diego Di Masi, University of Turin, Italy; **Co-Author:**Chiara Sità, University of Verona, Italy

LabT (territorial laboratory) is a collaborative space in which researchers and professionals working in child and family welfare and child protection in Italy design innovative actions to support parents and children. LabT is a part of the P.I.P.P.I. program (national program for supporting children and families living in a situation of vulnerability).A case-study on the work of LabTs in Northern Italy is used to analyze these multi-professional contexts as Activity Systems, using the lens of Activity Theory to understand the processes driven by emerging contradictions. The data we draw upon in this presentation are field notes and recordings from group discussions with professionals and informal helpers connected by a common engagement in child protection and child and family support in Casale Monferrato (Piemont), as well as ecomaps and documents produced by the groups. The Local Report concerning the results of the program implementation in the region is used as mirror data for the group discussions in which social workers, healthcare professionals, teachers, school principals, social educators, foster families are involved. The group discussions aim to identify the main needs as well as the strengths and weaknesses of their collective action towards children and families.The presentation analyzes the case study highlighting how sharing and discussing contradictions about different representations of the role of the local support network promote expansive learning and qualitative change in the LabT's actions.

Academic development courses in HE – a retrospective approach for future training practices

Keywords: Communities of Practice, Higher Education, Qualitative Methods, Quantitative Methods

Presenting Author:Sylvi Vigmo, University of Gothenburg, Sweden; **Co-Author:**Margareta Jernås, University of Gothenburg, Sweden

While conditions for teaching and learning in higher education have increasingly been investigated from many diverse perspectives, less focus has however been directed towards mandatory academic development among teaching staff/lecturers, and the potential impact of such courses on teaching practices. To be

able to apply for promotion and employment as a teacher, Swedish universities generally require educational training, corresponding to 10 weeks, based on national recommendations by The Association of Swedish Higher Education Institutions (SUHF, 2016). With this survey study we aim to shed light on teaching academics' experiences, reflections and attitudes after participation in mandatory educational training as one dimension of continuous professionalism in the Swedish context of higher education, at University of Gothenburg. While looking back at ten years of such courses, survey respondents representing this period, offer insights into their expectations, challenges and tensions, and their professional learning. Departing from the analyses of our material, we present, discuss and problematize ways forward for academic development beyond the current mandatory educational training. This approach is underpinned by national and international research in the professional development of teaching and learning practices.

EXPLORING WOMEN'S LEARNING THROUGH THE CASE OF KHWaab: WOMEN'S SKILL DEVELOPMENT CENTRE IN INDIA

Keywords: Case Studies, Communities of Practice, Lifelong Learning, Qualitative Methods

Presenting Author:Bhavna Rawat, University of Oulu, Finland, Finland

Target 4.3 of the United Nations' Sustainable Development Goals states that- "By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university." In a drastically changing world during Covid-19 times, women Self-Help Groups (SHGs) in India have actively engaged with mitigation relief strategies across communities. The role of such spaces becomes crucial for ensuring access to quality learning, skill-development, and fostering leadership at the grass-root level. This research follows an embedded case design of Khwaab, a women's skill development centre in Delhi. The research aims are- 1) to understand trainers' perceptions about learning and its influence on the training design, 2) to capture voices of learners through their interpretations of learning experiences and perceived ways of participation. The study adheres to social constructivist paradigm, drawing on sociocultural approaches to learning, through theoretical lens of community of practice and situated learning. Lifelong learning framework characterises Khwaab as a site of non-formal learning. Feminist theories from India contextualise the case and participants. Findings from thematic analysis of audio-recorded interviews of 5 learners and 2 trainers, and summative content analysis of training toolkit showcase eight themes, spanning over characterisation of learners, their collective identity, group interaction, responsive organisational structures, and interpretations of empowerment. This case study has implications for creating new or improving the existing teaching-learning designs and organisational structures in non-formal learning settings, especially for women. Insights from the findings may further the dialogue to reconceptualise social development as a learning process.

Session C 5

23 August 2021 14:30 - 15:30

Session Room 10

Single Paper

Learning and Social Interaction

Social Interaction and Teaching

Keywords: Collaborative Learning, Conversation/Discourse Analysis, Culture, Peer Interaction, Pre-service Teacher Education, Self-regulation, Social Interaction, Teaching/Instruction

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 16 - Metacognition

Chairperson: Cyril Brom, Czech Republic

Effects of mastery-performance oriented teaching on self-regulation and achievement across cultures

Keywords: Culture, Self-regulation, Social Interaction, Teaching/Instruction

Presenting Author:Pablo E. Torres, University of Cambridge, United Kingdom; **Co-Author:**David Whitebread, Homerton College, University of Cambridge, United Kingdom; **Co-Author:**Ros McLellan, Cambridge University, United Kingdom

This study explored the predictive effect of mastery oriented teacher talk (valuing students' improvement/understanding) and performance oriented teacher talk (valuing students' good performance) for cognitive strategy use, persistence, and task accuracy of their 8- to 9-year-old students. Eight teachers and 49 students located in eight schools/classrooms from Chile and England participated in the study. To measure teacher talk, functional (socio-cultural) discourse analysis was applied to each teacher utterance found in a sample of 3 hours of Literacy lessons per classroom. Students' self-regulatory behaviours, such as cognitive strategy use and persistence, and students' task accuracy were measured by means of behavioural analysis using challenging tasks. OLS regressions were used to model the predictive effects of mastery and performance oriented teacher talk on students' cognitive strategy use, persistence and task accuracy. Results show universality in the way that mastery and performance oriented teacher talk predicted strategy use, but cultural-specificity in how they predicted persistence and task accuracy. In particular, strategy use was positively associated to performance oriented talk and negatively associated to mastery oriented talk across cultures. Persistence and task accuracy were only predicted by teacher talk in England. Specifically, in England, persistence was positively associated to mastery oriented talk and negatively associated to performance oriented talk. Conversely, task accuracy was positively associated to performance oriented talk and negatively associated with mastery oriented talk. This exploration calls to continue studying the universality and culture-specificity of the effects that mastery and performance oriented teacher talk might have on student self-regulation and task achievement.

"There are two gaps, so": Materials as resources for correction in pre-service teachers' classes

Keywords: Conversation/Discourse Analysis, Pre-service Teacher Education, Social Interaction, Teaching/Instruction

Presenting Author:Frantisek Tuma, Masaryk University, Czech Republic

This paper investigates how pre-service teachers of English as a foreign language (EFL) do correction during their initial teaching practice at lower-secondary schools. The study employs multimodal conversation analysis on a dataset of recordings of 16 lessons taught by three pre-service teachers in Czechia. The analysis focuses specifically on how the teachers orient to the task format when doing correction in answer-check sequences. The analysis shows how the teachers employ talk, gesture and gaze to make the task format (such as gap-filling, matching) relevant and thereby use the materials as points of reference as well as resources for structuring classroom discourse. This use of materials contributes to the completion of the correction sequences. It is concluded that (over-)reliance on teaching materials and limited flexibility, which can be observed in not accepting alternative answers produced by learners, seem to be manifestations of some of the traits of pre-service teachers' performance.

Preparing students for collaboration: Effects of an in-class training in transactive communication

Keywords: Collaborative Learning, Peer Interaction, Social Interaction, Teaching/Instruction

Presenting Author:Susanne Jurkowski, Universität Erfurt, Germany; **Co-Author:**Lukas Mundelsee, University of Erfurt, Germany; **Co-Author:**Martin Haenze, University of Kassel, Germany

In contrast to working alone, students in collaborative learning have the opportunity to get to know alternative ideas from their learning partner and to cognitively engage with their learning partner's ideas, build upon them and transform them into more elaborate ones. These cognitive interactive activities become visible in students' communication, in particular in their transactive communication. In transactive communication, students take up their learning partner's ideas by clarifying or completing them, adding further information, critiquing or comparing and integrating the partner's idea with an idea of one's own.

This study investigates whether students can acquire skills for transactive communication integrated into the teaching of subjects in collaborative learning. We developed an interdisciplinary lesson unit that focused on three levels: students learned about the subject world hunger (1) and practiced transactive communication (2) using a variety of cooperative learning methods (3).

In a pretest-posttest-design, students attending this training in transactive communication were compared to students attending a training in presentation skills, which was also combined with the subject world hunger and cooperative learning. Dependent variables were coded transactive statements during working in dyads, students' self-reports on their transactive communication and their knowledge about the learning topic before and after the training. Analyses revealed that from pretest to posttest students in the experimental condition showed an increase in transactivity while transactive communication in the control group remained stable. However, there was no interaction between condition and time for students' knowledge acquisition.

Session C 6

23 August 2021 14:30 - 15:30

Session Room 7

Single Paper

Learning and Instructional Technology, Teaching and Teacher Education

Communities of Practice

Keywords: Communities of Practice, Educational Technology, In-service Teacher Education, Primary Education, Quantitative Methods, School Effectiveness, Survey Research, Teacher Professional Development

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 23 - Educational Evaluation, Accountability and School Improvement (merged with SIG 18)

Chairperson: Marcus Friedrich, Germany

Trajectories of teacher agency in the professional community and association to experienced burnout

Keywords: Communities of Practice, Quantitative Methods, Survey Research, Teacher Professional Development

Presenting Author:Jenni Sullanmaa, Tampere University, Finland; **Co-Author:**Kirsi Pyhältö, University of Helsinki, Finland; **Co-Author:**Janne Pietarinen, University of Eastern Finland, Finland; **Co-Author:**Tiina Soini-Ikonen, Tampere University, Finland

Teacher agency plays an essential part in teacher's professional development. This study explored teacher's agency in the professional community, referring to teacher's ability, motivation and efficacy to use the professional community as a resource for learning. Survey data were collected from Finnish comprehensive school teachers (N = 2645) annually at three time points. Trajectories of teacher agency in the professional community during a three-year follow-up were identified with latent profile analysis. Four profiles of agency in the professional community were identified: 1) High and enduring agency; 2) Rise in agency; 3) Drop in agency; and 4) Moderate agency. The results showed that the profiles differed in terms of experienced socio-contextual burnout. The study contributes to the research on teacher learning and well-being by identifying individual variation in teachers' experiences of agency in the professional community and by examining the association with perceived burnout symptoms.

Transformative agency in teachers' reflections on professional digital competence

Keywords: Communities of Practice, Educational Technology, Primary Education, Teacher Professional Development

Presenting Author:Ewa Skantz-Åberg, University of Gothenburg, Sweden; **Co-Author:**Apostolia Roka, University of Gothenburg, Sweden; **Co-Author:**Mona Lundin, University of Gothenburg, Faculty of Education, Sweden; **Co-Author:**Pia Williams, University of Gothenburg, Sweden; **Co-Author:**Annika Lantz-Andersson, University of Gothenburg, Sweden

Transformative agency in teachers' reflections on professional digital competenceThe digitalization of society entails a strong focus in educational policies and curricula on the necessity of developing digital competence for participation in democratic societies. This implies changed conditions for the teaching profession. The aim of this practice-centred study is to explore how teachers' transformative agency related to the development of competence for teaching in digitalized classrooms evolve in reflective discussions. The study involves three main iterative phases; i) workshops where teachers and researchers in collaboration develop instructional scenarios related to specific curriculum contents, ii) several lessons where the instructional scenarios are implemented by the teachers, iii) reflective discussions by teachers and researchers where video sequences from the instructional scenarios are used as elicitation. Phases two and three are video documented. The unit of analysis in this study is the teacher's reflective discussions in phase three. The study involves six Swedish teachers working in pairs in preschool classes and five researchers. Theoretically, the study is based on sociocultural perspectives, acknowledging that teachers' interactional challenges in digitalized classrooms require agents to change. The concept transformative agency is, by means of Interaction analysis, used to analytically identify the situated and collectively formed trajectories of the reflections on the practice, implying intertwined changes of both the human actors and the practices. Preliminary findings accentuate that the joint reflections enabled increased awareness of the teachers' professional practice, mediated future orientation and envisioned competence for teaching in digitalized classrooms.

Sustainable school development in a digitalized world: Results from interviews in networked schools

Keywords: Communities of Practice, Educational Technology, In-service Teacher Education, School Effectiveness

Presenting Author:Anna Heinemann, University of Duisburg-Essen, Germany; **Co-Author:**Marco Hasselkuß, University of Duisburg-Essen, Germany; **Co-Author:**Manuela Endberg, University of Duisburg-Essen, Germany

Current societal changes and concerns for a sustainable development in education also affect the increasing educational process taking place in a digitalized world. Consequently, new requirements to educational systems arise to enable people to understand and shape such change processes.

In the ongoing research project "DigiSchoolNet – Digital School Development in Networks", funded by the Federal Ministry of Education and Research in Germany and carried out at the University of Duisburg-Essen, organisational paths towards the integration of ICT in education in different schools are analysed. The schools collaborate in networks in order to support school development processes for addressing education in the context of digitalization. During the project, two different research methodologies have been conducted in order to analyse the process of collaboration and knowledge transfer from a network to the teachers in school: 1) interviews with teachers and headmasters, 2) ego-centric network analysis of teachers' professional networks. In this contribution intermediate results of the interviews held with teachers and headmasters will be presented. The main focus is set upon the requirements for a) a successful school developmental path towards education in a digitalized world and b) a successful collaboration concerning education in a digitalized world in schools and between schools in the networks in order to detect paths of sustainable knowledge transfer between educational professionals working in schools.

Session C 7

23 August 2021 14:30 - 15:30

Session Room 9

Single Paper

Learning and Social Interaction, Motivational, Social and Affective Processes

Collaborative Learning and Video Analysis

Keywords: Collaborative Learning, Learning Technologies, Motivation, Motivation and Emotion, Peer Interaction, Qualitative Methods, Reasoning, Video Analysis

Interest group: SIG 08 - Motivation and Emotion, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Marieke Thurlings, Eindhoven University of Technology, Netherlands

Linking students' reports on motivation to the level of interaction during collaborative learning

Keywords: Collaborative Learning, Motivation, Peer Interaction, Video Analysis

Presenting Author:Tatiana Shubina, University of Oulu, Finland, Finland; **Co-Author:**Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:**Kristiina Mänty, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland

This study aims to explore how students with different situational motivation engage in the cognitive and socio-emotional interaction with their group peers during collaborative learning. The sample comprised of 94 13-year-old students who worked on collaborative tasks in small groups during a 5-session science course. All sessions were recorded with microphones and 360-degree cameras, which allowed to trace students' task execution, and cognitive, socio-emotional, and other interactions. Additionally, students were asked to report their situational motivation by evaluating the current emotional valence and situational interest before and after every collaborative task. Nonparametric Kruskal-Wallis H, Mann-Whitney U tests and trend estimation by calculating the moving average were

conducted to examine the data. The results show that students with positive situation motivation change managed to keep a more stable level of interaction and had significantly more socio-emotional and task execution interactions during collaborative learning compared to students with moderate change. Further research is needed to investigate more thoroughly how students situational motivation is related to their interaction during collaborative learning.

Strategic activities in co- and socially shared regulation of emotions

Keywords: Collaborative Learning, Motivation and Emotion, Qualitative Methods, Video Analysis

Presenting Author:Kristiina Mänttä, University of Oulu, Finland; **Co-Author:**Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:**Tiina Törmänen, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland

Socio-emotional interactions are a part of collaboration process where group members build motivational ground and emotional atmosphere for learning together by engaging in co- and socially shared emotion regulation activities. How co- and socially shared regulation of emotions and motivation manifests as strategic activities on a group level, however, still lacks clarification. The aim of this study is to explore the characteristics of group level strategic regulation activities, particularly how co- and shared regulation activities differ from each other. Participants are 13-year-old secondary school students ($N = 90$) working in five science learning sessions in small groups. Groups' collaborative working was videotaped (225 hours in all). Four groups were chosen for in-depth analysis. The analysis proceeded first by detecting co- and socially shared regulation episodes from the video data. Next, different types of regulation strategies were recognised inductively from the episodes and further classified in different strategy types. The results indicate that the group level emotion and motivation regulation in socio-emotional interaction often focuses on multiple targets, namely regulating simultaneously motivational/emotional, cognitive and behavioural aspects. Co-regulation was more commonly used, but co-regulated episodes were shorter than shared regulation episodes, and tended to focus more on behavioural aspects of the situation. In socially shared regulation episodes, groups most often engaged in strategic activities that focused on motivational and cognitive aspects of the situation. A detailed analysis of group level regulatory activities is needed for exploring what kinds of strategic activities are beneficial for group's socio-emotional atmosphere and motivated collaboration.

8th graders' ideas of contributing to sustainability – a study of students' talk and microblogging

Keywords: Collaborative Learning, Learning Technologies, Reasoning, Video Analysis

Presenting Author:Kari Anne Rødnes, University of Oslo, Norway

This study investigates how students in an 8th grade class (12-13 year olds) express and discuss their opportunities to contribute to sustainable development. To access the students' reasoning and their emerging understanding, we study their communication as it unfolds through one lesson involving classroom talk and microblogging. We demonstrate how ideas about sustainability actions are generated and travel across activities in the classroom, how ideas are explored, broadened and gain attention. We argue that dialogic pedagogy can support students in developing awareness of sustainability and action competence. By allowing students to express a variety of ideas, ask questions and provide reasons, topics can be explored. Through such exploratory work, students are actively involved, and supported in developing connections between everyday actions and broad sustainability issues, while practicing competences such as critical thinking and collaboration.

Session C 8

23 August 2021 14:30 - 15:30

Session Room 4

Single Paper

Higher Education, Instructional Design

Instructional Design and Comprehension of Text and Graphics

Keywords: Assessment Methods and Tools, Comprehension of Text and Graphics, Higher Education, Instructional Design, Metacognition, Problem Solving, Quasi-experimental Research, Secondary Education

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 06 - Instructional Design

Chairperson: Antonia Zachariou, University of Roehampton, United Kingdom

Fostering upper secondary school students' sourcing during online inquiry

Keywords: Comprehension of Text and Graphics, Instructional Design, Quasi-experimental Research, Secondary Education

Presenting Author:Elina Hämäläinen, University of Jyväskylä, Finland; **Co-Author:**Carita Killi, Tampere University, Finland; **Co-Author:**Eija Räikkönen, University of Jyväskylä, Finland; **Co-Author:**Minna Lakkala, University of Helsinki, Finland; **Co-Author:**Liisa Ilomäki, University of Helsinki, Finland; **Co-Author:**Auli Toom, University of Helsinki, Finland; **Co-Author:**Miika Marttunen, University of Jyväskylä, Finland

This study investigated the efficacy of a teacher-led intervention targeted to foster upper secondary school students' sourcing during the online inquiry. Students ($N = 365$) were divided into two conditions, an intervention group (196 students) and a control group (169 students). The lessons of the intervention (4×75 min) were implemented during a language arts course titled "Texts and influence". The lessons were based on phases of online inquiry: searching for information, evaluating information, synthesizing information and communicating information to others. During lessons, students investigated one of four controversial health topics in small groups. The control group participated in an ordinary "Texts and influence" course. Students' sourcing performance was tested before and after the intervention with an online inquiry task. In both tests, students were tasked to solve a dilemma dealing either with vaccination or fats by specifying their information need, searching for information with a search engine, evaluating information and writing a justified recommendation based on found information. Topic order was counterbalanced in both conditions. The background variables (Pre-test scores, Reading fluency, Prior topic knowledge and Topic order) were controlled for in the regression analyses. The results showed that the intervention fostered students' sourcing in search queries, source evaluations and written product. Sourcing in specifying information need was not improved. This study implicates that students' sourcing skills can be improved through context-based intervention where sourcing is taught and practised in different phases of online inquiry.

Reducing Split-Attention by Interactive Signaling and Visual Integration: An Eye Tracking Study

Keywords: Assessment Methods and Tools, Comprehension of Text and Graphics, Instructional Design, Problem Solving

Presenting Author:Marlit Annalena Lindner, IPN - Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Jung Aa Moon, ETS – Educational Testing Service, Princeton, NJ, United States; **Co-Author:**Julia Dietze, IPN – Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Burcu Arslan, ETS – Educational Testing Service, Princeton, NJ, United States

This eye tracking study, including $N = 66$ university students, increases our understanding of the effects of two different design approaches to reduce split attention in the context of geometrical problem solving. We investigated a digital "hover tool" in line with the *Signaling Principle* that allowed students to highlight task-relevant information when needed (i.e., hovering over an information icon with the computer cursor) as a between-subject factor (hover tool available vs. no hover tool available). We further manipulated the design of items in the test in line with the *Spatial Contiguity Principle* as a within-subject factor (integrated vs. non-integrated). We used (generalized) linear mixed-effects models to analyze the outcome and process data from this 2×2 mixed design. Our main goal was to draw in depth conclusions about the effectiveness of both integration methods to reduce split-attention and enhance test-takers' item solving efficiency, as operationalized by time on task and different eye tracking measures (i.e., fixation times and transitions across areas of interest). As expected, we found that both approaches improved item solving efficiency and reduced split-attention as indicated, for example, by a lower time on task and significantly lower number of transitions between areas of interest in both experimental conditions. Our eye tracking data provide detailed insights into the item solving processes that were facilitated by the two integration aids. Overall, our data suggest that simple spatial integration had a more substantial effect on problem solving efficiency than interactive hovering.

Measuring and monitoring multiple document comprehension with a Dutch version of the MDC-instrument

Keywords: Assessment Methods and Tools, Comprehension of Text and Graphics, Higher Education, Metacognition

Presenting Author:Huib Tabbers, Erasmus University Rotterdam, Netherlands; **Co-Author:**Carolin Hahnel, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Cornelia Schoor, University of Bamberg, Germany

Multiple document comprehension skill is the ability to form an integrated representation of multiple texts, including source information. This skill is especially important for university students, who often have to work with a wide range of online resources. Schoor et al. (2020) recently developed and validated a new German measure to assess multiple document comprehension skill: the MDC-instrument. To assess the validity of the instrument for a different population, the units from this instrument were translated to Dutch and tested within a sample of 122 psychology students from the Netherlands. Their scores on performance, perceived difficulty, and mental effort for each unit were compared to the scores from the original German sample. The results showed a close correspondence between the score patterns, suggesting that the MDC-instrument can validly be used within a different population. Students were also asked to provide an estimate of their performance on each unit, to establish how accurately they could monitor their multiple document comprehension skill. Earlier research on text comprehension has suggested that the accuracy of estimates is related to performance level, but the results did not show such an association. Multiple document comprehension thus seems to provide a different kind of challenge to metacognitive monitoring.

Session C 9

23 August 2021 14:30 - 15:30

Session Room 16

Single Paper

Motivational, Social and Affective Processes

Educational Psychology, Motivation and Emotion

Keywords: Developmental Processes, Educational Psychology, Motivation, Motivation and Emotion, Parental Involvement in Learning, Science Education, Self-efficacy

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Marta Koć-Januchta, Linköping University, Sweden

Self-effective scientific reasoning? Differences between primary and secondary school students

Keywords: Educational Psychology, Motivation and Emotion, Science Education, Self-efficacy

Presenting Author:Kristin Nyberg, University of Education Freiburg, Germany; **Co-Author:**Susanne Koerber, University of Education Freiburg, Germany; **Co-Author:**Christopher Osterhaus, University of Vechta, Germany

Self-efficacy expectations not only influence students' performance in typical school subjects, such as mathematics, they also relate to performance on constructs not explicitly embedded in the curriculum, such as scientific reasoning. The present study assesses self-efficacy expectations in 4th and 8th graders (N =288, 150 girls). In contrast to most existing work, we assess different levels of self-efficacy (academic and task-specific) and compare two age groups, which differ in their experience with scientific reasoning tasks. Based on the literature, we expect scientific reasoning to correlate more strongly with task-specific than academic self-efficacy. Based on 8th graders' experience and opportunity to work on science problems, we assume correlations to be stronger in grade 8 than 4. As expected, the strongest correlations emerged between task-specific self-efficacy and scientific reasoning, in grade 4 ($r=.194^*$) and grade 8 ($r=.290^{**}$). In grade 8, an additional correlation between academic self-efficacy and scientific reasoning ($r=.253^{**}$) was found. To reveal interindividual differences, a cluster analysis was conducted. Students in the most frequent cluster (n=51, 36.4%) in grade 4 performed poorly and overestimated their performance. Students in the most frequent cluster in grade 8 (n=52, 35.1%) revealed high performance and high self-efficacy. This cluster was not present in grade 4, suggesting that children acquire more realistic views on their self-efficacy with age and experience. Interindividual variations were found in both grades 4 and 8, and there was no significant difference between boys and girls. Our findings suggest that not all students might benefit from promoting self-efficacy in scientific reasoning.

Gender and temperament differences in task avoidance during the transition to lower secondary school

Keywords: Developmental Processes, Educational Psychology, Motivation, Motivation and Emotion

Presenting Author:Riikka Hirvonen, University of Eastern Finland, Finland; **Co-Author:**Jaana Viljaranta, University of Eastern Finland, Finland; **Co-Author:**Noona Kiuru, University of Jyväskylä, Finland

The aim of this study was to examine to what extent students' task-avoidant behavior changes during the transition from primary school to lower secondary school and to what extent these changes are influenced by students' gender, pubertal status, and temperament. The participants were 842 Finnish students (53.9% girls) who rated their task-avoidant behavior three times: spring of Grade 6 in primary school and fall and spring of Grade 7 in lower secondary school. Student ratings of their pubertal status and parent ratings of students' temperament (effortful control, negative affectivity, and surgency) in Grade 6 were used to predict the development of task avoidance, controlling for school type and GPA. Separate linear growth curve models were created for girls and boys as the findings suggested significant gender differences: both genders increased in task avoidance from the end of Grade 6 to the end of Grade 7, but boys reported a higher initial level and a larger increase in avoidance. The results further showed that pubertal status and temperament in Grade 6 were significant predictors of task-avoidant behavior: Among both genders, the higher the students' pubertal status and the lower their effortful control, the more task avoidance they initially reported. Among girls, low surgency and low negative affectivity were also associated with higher initial task avoidance. Among boys, in contrast, low negative affectivity was related to lower avoidance. Furthermore, increase in boys' task-avoidant behavior during the school transition was predicted by low effortful control, low negative affectivity, and high surgency.

Parental involvement in children's homework: The role of parent motivational beliefs and affect

Keywords: Developmental Processes, Educational Psychology, Motivation and Emotion, Parental Involvement in Learning

Presenting Author:KONSTANTINA FALANGA, Aristotle University of Thessaloniki, Greece; **Co-Author:**Eleftheria Gonida, Aristotle University of Thessaloniki, Greece; **Co-Author:**Dimitrios Stamovlasis, Aristotle University of Thessaloniki, Greece

Parental involvement in homework is the most controversial type of parents' involvement in children's education. Limited studies have investigated the predictors of different involvement types and relevant longitudinal research is still missing. The present study explored the longitudinal associations between parents' motivational beliefs and emotions and different types of involvement in math homework during the last two years of elementary school (5th and 6th grade). Parents, completed surveys four times (in the beginning and at the end of each grade) measuring their involvement (autonomy support, control, interference), achievement goals (mastery and performance), beliefs of their child's efficacy in mathematics and homework-related affect (positive and negative). Path analysis tested a model examining the cross-lagged associations among the variables under investigation across the 4 time points. The main results from Grade 5 to Grade 6 were: (i) parent mastery goals negatively predicted controlling involvement and parent performance goals positively predicted control and interference, (ii) parent beliefs of the child's self-efficacy in mathematics negatively predicted interference, (iii) parent positive affect positively predicted autonomy support. In general, parents' performance goals and beliefs of child's efficacy were the most frequent significant predictors of their involvement in homework and affect across time. Moreover, most cross-lagged significant changes occurred from Time 2 to Time 3, that is during children's transition from Grade 5 to Grade 6. Findings are discussed based on current theory and evidence on parental homework involvement and implications for practice will be pointed out.

Session C 10

23 August 2021 14:30 - 15:30

Session Room 17

Single Paper

Learning and Social Interaction, Learning and Special Education, Teaching and Teacher Education

Democratic Education and Educational Policy

Keywords: At-risk Students, Attitudes and Beliefs, Citizenship Education, Educational Policy, Interdisciplinary, Learning Disabilities, Pre-service Teacher Education, Quantitative Methods, Reflection, Social Sciences, Teaching Approaches

Interest group: SIG 13 - Moral and Democratic Education

Chairperson: Carina Lüke, University of Würzburg, Germany

How Do Schools Affect Inequalities in Political Participation: Compensation of Social Disadvantage?

Keywords: At-risk Students, Citizenship Education, Quantitative Methods, Social Sciences

Presenting Author: Daniel Deimel, University of Duisburg-Essen, Germany; **Co-Author:** Hermann J. Abs, University of Duisburg-Essen, Germany

Both direct and indirect influences have been assumed to impact the transmission of political orientations within families. A lower socioeconomic status is related to lower intended political participation of adolescents. Within this context, schools play a crucial role in political socialisation, as citizenship education is assumed to either equalise or maintain these social disparities. We analyse a sub-dataset of the International Civic and Citizenship Education Study 2016 (ICCS 2016) which includes 14-year-old students in four European countries: Belgium (Flanders), Denmark, Germany (North Rhine-Westphalia) and the Netherlands ($N=13,500$). Multi-level regression analyses reveal that formal citizenship education compensates the relationship between students' socioeconomic status (SES) and intended electoral participation in Denmark, Germany (NRW) and the Netherlands, but not in Belgium (FL). Further, students in classrooms with higher average SES are more likely to report an open classroom climate in each of the four countries and to experience participation in civic activities at school in three out of four countries.

Dialogue and critical thinking as prevention against antidemocratic attitudes

Keywords: Attitudes and Beliefs, Pre-service Teacher Education, Quantitative Methods, Reflection

Presenting Author: Kristin Endresen-Maharaj, University of Agder, Norway; **Co-Author:** Ase Haraldstad, University of Agder, Norway; **Co-Author:** Aslaug Kristiansen, University of Agder, Norway

In Norway and other European countries, the occurrence of racially and antidemocratic motivated incidents have increased. The school is the arena where children encounter the most racist and group-hostile expressions. Therefore, an important task is to provide teachers with skills in order to better handle various expressions of racism, anti-Semitism and discrimination. In 2012 a national school-oriented project Dembra (Democratic prevention against racism and anti-Semitism) was established. Basic principles in the Dembra project is that prejudice and group hostility can best be prevented through an inclusive school culture, democratic competence and critical thinking. Our study is inspired by the ideas of the national Dembra project, but it is carried out in a teacher education programme. The theoretical approach is philosophical conversations and critical thinking based on the ideas that in a democratic tradition, opinions and ideas should be expressed and listened to. There exists little research on Dembra in teacher education. In our study we examined ways of preparing pre-service teachers to work against all forms of discrimination. We asked: What does pre-service teachers find useful when working with issues of inclusion, critical thinking and democracy in the classroom? In our study, we collected 335 questionnaires from pre-service teachers and Bachelor students in pedagogy. Our findings suggest that pre-service teachers found the following particularly useful: other students helped them see different perspectives; moments of surprise in the teaching session helped them in their own reflection process; the approaches used demanded a high level of activity on their part.

Building an Inclusive Education System: Implications from a Therapy Support Project in Ireland

Keywords: Educational Policy, Interdisciplinary, Learning Disabilities, Teaching Approaches

Presenting Author: Emer Ring, Mary Immaculate College, Limerick, Ireland, Ireland; **Presenting Author:** Lisha O'Sullivan, Mary Immaculate College, Ireland

A range of research in Ireland has continued to indicate that the achievement of an inclusive education system requires support from a range of disciplines. In 2018/2019, the Irish Government commissioned an independent evaluation of a Demonstration Project (DP), providing occupational and speech and language therapy services to 150 sites and 27,678 children across early years, primary, post-primary and special school settings. Building on existing psychological and inclusion services, the DP sought to improve the learning process and outcomes for all children through delivering an evidence-based tiered model of therapy support. This paper reports on the evaluation and impact of the DP in terms of the learning process and outcomes and identifies implications for building inclusive education systems. While the project faced a number of implementation challenges initially, findings indicate increased academic engagement (80%); increased positive classroom interactions (70%); increased positive social interactions (69%) and increased differentiated instruction (68%).

Session C 11

23 August 2021 14:30 - 15:30

Session Room 18

Single Paper

Cognitive Science, Learning and Social Interaction

Writing and Literacy

Keywords: Attitudes and Beliefs, Comprehension of Text and Graphics, Doctoral Education, Educational Psychology, Ethnography, Higher Education, Quantitative Methods, Social Interaction, Writing/Literacy

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 12 - Writing

Chairperson: Debra Myhill, University of Exeter, United Kingdom

The effects of summarising texts on text comprehension and subjective ratings of understanding.

Keywords: Comprehension of Text and Graphics, Educational Psychology, Quantitative Methods, Writing/Literacy

Presenting Author: Amy Peters, University of Southampton, United Kingdom

Writing is an important tool for both communicating information and enhancing learning. The current study explored writing-to-learn in the context of summarising a source text, and analysed effects on text comprehension and subjective understanding. 63 participants (current higher education students) read a text passage about solar activity, created either an outline or synthetic plan, and then wrote either an essay or free recall text about the source text, before returning two-days later to answer text comprehension questions. Participants rated their subjective understanding of the text pre-writing, post-writing and two-days later. Regardless of planning or writing condition, participants' subjective understanding ratings decreased across the three time points, confirming an 'illusion of explanatory depth' (Rozenblit & Keil, 2002). These subjective understanding ratings were significantly correlated with text comprehension scores. The fact that these effects did not vary depending on planning or writing strategy suggests that these are general effects of retrieval practice. The main conclusion from the study was that writing by summarising a source text involves very different processes than writing about own knowledge (which typically shows increases rather than decreases in ratings of subjective understanding).

Do UK university students with and without dyslexia have different beliefs about writing?

Keywords: Attitudes and Beliefs, Higher Education, Quantitative Methods, Writing/Literacy

Presenting Author: Sophie Hall, University of Southampton, United Kingdom

Evidence implies that university students' beliefs about writing affect text quality and knowledge development outcomes in academic writing. However, measurements of writing beliefs have been validated only in student populations without learning difficulties, such as dyslexia. This study, therefore, aimed to investigate whether writing beliefs could be measured in the same way for students with and without dyslexia and then assessed whether there were any differences in the two groups' beliefs. In this study, UK university students with ($N=69$) and without dyslexia ($N=493$) completed a new writing beliefs inventory

(WBI; Galbraith and Baaijen, in preparation) online or on paper. Exploratory structural equation modelling (ESEM) revealed that the questionnaire had a 5-factor structure that was invariant across both groups of students, representing transmissional, transactional, planning, revision, and audience beliefs about writing. Latent means comparisons revealed that students with dyslexia scored higher on transmissional and planning items, suggesting that they prioritise reporting accurate information from authoritative sources and planning within academic writing activities. Students without dyslexia scored higher on transactional items, implying that they prioritise developing their understanding of the writing topic throughout writing.

The results from this study give initial evidence to suggest that writing beliefs can be measured in the same way across UK university students with and without dyslexia, but that the two groups have differing beliefs about which aspects of writing are most important. Further research is needed to indicate whether these differences in writing beliefs result in different writing outcomes (e.g., text quality and knowledge development).

Academic agency and responsibility through writing processes

Keywords: Doctoral Education, Ethnography, Social Interaction, Writing/Literacy

Presenting Author: Ylva Lindberg, Jönköping University, Sweden; **Co-Author:** Sangeeta Bagga-Gupta, Jönköping University, Sweden

The millennium shift has witnessed an academic writing turn in the view of academic writing as "an essentially and private process" (Maher et al. 2008). Social aspects of writing that have been acknowledged in the scholarship point towards perspectives on how norms within academics are negotiated, and which norms, cultures and languages that are present in academic writing processes where students with different experiences participate (Hellstén & Ucker Perotto 2018. Turner 2003). This study presents patterns of progression among PhD students in a doctoral course in academic writing, i.e. skills and insights offered and/or acquired within the course that potentially are useful for *action* as a full-fledged researcher. The analysis is based on ethnographic documentation of the course across three different academic years of delivery. The findings highlight the role of social activities within the course for broadening and deepening understandings of academic work and mission.

Session C 12

23 August 2021 14:30 - 15:30

Session Room 5

Invited Symposium

Higher Education, Learning and Instructional Technology

E-CER: Analytical approaches on collaborative learning with digital knowledge objects

Keywords: Collaborative Learning, Computer-supported Collaborative Learning, Educational Technology, Higher Education, Knowledge Creation, Learning Analytics, Learning Technologies, Mixed-method Research, Qualitative Methods, Quantitative Methods, Student Learning

Interest group:

Chairperson: Hanni Muukkonen, University of Oulu, Finland

Organiser: Crina Damsa, University of Oslo, Norway

Discussant: Lina Markauskaite, University of Sydney, Australia

In this E-CER symposium, we focus on methodologies and analytical approaches applied to collaborative learning that integrates digital knowledge objects. Collaborative, small group activities are strategies that provide learners with the opportunities to work with knowledge contents and advance collaborative competence through discussions, negotiation, writing or creating together, and managing joint work. Often, such collaborative work involves activities with knowledge objects. These can be artefacts such as shared workspaces or tools within a group's collaborative environment, e.g., representational tools or visualizations, but can also be groups' shared products (e.g., students' assignments, reports, data). While social, discursive and regulatory aspects of collaborative learning have been examined extensively, there is less research and systematic analysis of collaborative processes that includes working or using knowledge objects, and the role of these objects in collaboration and learning. In this symposium, we share methods and approaches to analyzing collaboration activities that involve digital objects being developed jointly (i.e., essays, text in a google document, digital format presentations) in four different educational contexts, spanning secondary and tertiary education. The four contributions, from Netherlands, Finland, Norway and Australia present a range of analytical approaches, including mixed methods analysis, analytics of online collaboration and qualitative interpretations of small-group activities and collaborative work with knowledge objects. The contributions are part of an overarching effort to develop analytical, technology-enhanced approaches, frameworks and instruments that allow us to capture in a systematic way the complexities the collaborative process, for further use in research and for supporting educational practice.

Examining antecedents, processes, and consequences in collaborative learning with knowledge objects

Presenting Author: Anouschka van Leeuwen, Utrecht University, Netherlands; **Co-Author:** Jeroen Janssen, Utrecht University, Netherlands

Knowledge objects (i.e., students' assignments, essays, reports) play an important role during collaborative learning: they evolve as representations of students' collective or individual knowledge and thus provide a window on students' understanding. Furthermore, knowledge objects can serve as resources for conversation during collaboration. Research on collaborative learning can often be characterized as either effect-oriented or process-oriented research. We argue that to gain an understanding of collaborative learning with knowledge objects it is necessary to study – simultaneously – the antecedents, processes, and consequences of collaboration with knowledge objects. The *antecedents* of collaboration refer to student-, group-, task-, or technological characteristics that affect the way students collaborate; the *processes* to descriptions and qualities of the interactions between group members when they collaborate; and the *consequences* to resulting effects of the antecedents and processes of collaboration (e.g., individual achievement, group performance). The aim of this contribution is to illustrate how studying the antecedents, processes, and consequences may further our understanding of collaboration with knowledge artefacts, in comparison to studying one of these aspects in isolation. Using data from university students' online collaboration, we will highlight qualitative and quantitative approaches to analyze (a) how group size (antecedent) affects students' online discussion (process), and their written texts (consequence and knowledge object), and (b) how students reference and involve their written texts during the (social) regulation of their collaborative process (process) and how this affects the quality of their written texts (consequence). We will discuss opportunities and challenges of these kinds of analyses.

Question-driven Learning Analytics: Designing a Teacher-facing Dashboard for Online Breakout Rooms

Presenting Author: Dragan Gasevic, Monash University, Australia; **Co-Author:** Roberto Martinez-Maldonado, Monash University, Australia

The goal of Learning Analytics (LA) recently shifted to support reflective practices of teachers and students. This aim is usually achieved by providing stakeholders with end-user interfaces (for instance, dashboards). Meanwhile, the lack of involvement of teachers and students in design results in the lack of accounting for sense-making needs and opaque effectiveness of such interfaces for learning and teaching. Human-centred design approaches can be considered to address those issues by working closely with educational stakeholders and considering authentic pedagogical needs and intentions. This paper contributes to the emerging area of Human-Centred Learning Analytics (HCLA) and demonstrates a question-driven design approach to provide LA interfaces aimed to explicitly answer authentic questions teachers have. The study is situated in the context of synchronous online activities which are orchestrated by pairs of teachers using audio-visual and text-based tools (namely Zoom and Google Docs). This resulted in the design of an open-source tool to support real-time monitoring by teachers of collaborative student work in breakout rooms and collaborative documents.

Co-creation of knowledge objects in undergraduate education – a qualitative analytical approach

Presenting Author: Crina Damsa, University of Oslo, Norway; **Presenting Author:** Rachelle Esterhazy, University of Oslo, Norway; **Co-Author:** Monika Nerland, University of Oslo, Norway

This study presents a qualitative analytical approach applied to Software Engineering undergraduate students' collaborative development of software. To arrive to generate software solutions, students must learn how to make sense of and engage with programming and programming resources. Our study examines how students use programming strategies and collaborated to co-construct a shared knowledge object, i.e., the code/software. A rich set of data enabled a detailed examination: video recordings of group meetings, knowledge objects (notes, mock-ups, versions of software), and course materials. The micro-level qualitative analysis involved a thematic mapping of interactional data and objects/resources groups used. We then employed an interpretative approach and three

sensitizing notions for interpretation: emergence - how student groups make sense of and use new knowledge; object function –how developing objects were dealt with; and assemblage – the gathering and organizing of knowledge resources and collaboration. The study's findings emphasize the necessity for students to collaboratively engage ideas, strategies and challenges when pursuing programming solutions. Collective trialing of developing code enabled groups focusing the discussion and the developing efforts, productive both for learning and for engaging challenges. The analytical approach employed allowed gaining in-depth insights into both collaborative actions aimed to advance the shared object and to address challenges. The role and the value of the shared object can be identified and qualified through a double-step analysis, and the use of a data-driven but theory- informed analysis. Further research must explore the systematic capturing of the complexity of the interactional processes and the objects involved.

Qualities of shared objects, collaboration processes, and related competence gains

Presenting Author:Hanni Muukkonen, University of Oulu, Finland

The relationship of students' collaboration around digital knowledge objects and related competence gains remains not well understood. Two courses in higher education were investigated to describe the position the objects took in collaboration, and how students evaluated the process and learning outcomes. The first course involved students in an open-ended inquiry process to produce a group essay, and the second in writing up a case description by using concepts and research from the course literature. Mixed methods were employed to study how students described the benefits and problems in collaboration, self-assessed their competence development in knowledge work practices, and how these related to teacher-given grades. On the exterior the two courses held many similarities in type of course work and collaboration activities around the digital knowledge object. However, a prolonged group essay task generated more positive experiences about collaboration atmosphere, the reflection of collaboration, and scientific co-authoring. Further, students reported significantly higher learning about collaboration on objects, integration efforts, feedback, and persistent development in that first course even when they found combining interests and delineating objectives problematic. Complementary analytical approaches enabled contrasting evaluations and suggested that prolonged activities and feedback practices promoted competence in collaboration around digital knowledge objects.

Session C 13

23 August 2021 14:30 - 15:30

Session Room 1

Espresso Invited Symposium

Cognitive Science, Developmental Aspects of Instruction, Learning and Social Interaction

SIG 5: Early Creativity, Flexibility and Curiosity – How to Promote these 21st Century Skills?

Keywords: Cognitive Development, Cognitive Skills, Early Childhood Education, Problem Solving, Science Education, Social Development

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Paul Leseman, Utrecht University, Netherlands

Organiser: Esther Adi-Japha, Bar-Ilan University, Israel

Discussant: Esther Adi-Japha, Bar-Ilan University, Israel

While it has long been recognized that early childhood skills such as creativity, flexibility, and curiosity lead to better success in problem solving, academic tasks, and life satisfaction, the way these skills affect development, and more importantly, how to promote the development of these 21st Century Skills in young children, has received relatively little attention. In the four studies presented at this Espresso Symposium we explore how these skills affect development while looking at their domain-specific manifestation (e.g., scientific curiosity, reasoning about inclusion or exclusion) and the ways to encourage their development (e.g., the contribution of the environment, the effect of instructional language). To this end, in the context of these four studies, children's verbal and non-verbal responses to different tasks were coded and the children were asked to explain their choices and behavior. The online EARLI Conference discussion will focus on the questions of domain-general versus domain-specific depictions of creativity, flexibility, and curiosity: Does scientific curiosity promote curiosity in other domains? Is the capacity to evaluate competing perspectives about social inclusion or exclusion related to domain-general flexibility? How should these domain-general and domain-specific skills be promoted in children from different socioeconomic and linguistic backgrounds? What is the role of previous experience in specific domains, and what is the role of the childcare versus the home environment in promoting these skills?

Epistemic cognition and executive functioning in early childhood

Presenting Author:Susan Walker, Queensland University of Technology, Australia; **Co-Author:**Jo Lunn Brownlee, Queensland University of Technology, Australia; **Co-Author:**Laura Scholes, Australian Catholic University, Australia

Epistemic cognition refers to cognitive processes about the nature of knowledge and knowing (Sandoval, Greene & Bråten, 2016; Walker et al., 2020). Recent research (e.g. Brownlee et al., 2016; Brownlee et al., 2019; Walker et al., 2020) has provided insights into the ways epistemic development can contribute positively towards the inclusion of diverse children in school (e.g., Baumeister et al., 2005). We argue that, to engage in reasoning about inclusion or exclusion children may need both the capacity to evaluate competing perspectives (epistemic cognition) and the ability to be cognitively flexible. Cognitive flexibility forms a subset of skills within a suite of self-regulation skills known as Executive functions (EF). The current study proposes that the development of the core EF skill of cognitive flexibility may be related to young children's development of epistemic cognition by facilitating children's ability to take a variety of perspectives. A total of 82 children (58.5% male, Mean age = 4.46, SD = 0.44) participated. Children's cognitive flexibility (Executive Function) was assessed through three EF tasks designed to assess children's ability to flexibly shift from one mental set to another. Children's ability to engage with different perspectives (epistemic cognition) in the context of social inclusion/ exclusion was assessed through a new pictorial and interview methodology designed to capture children's reasoning in realistic situations involving a variety of perspectives. Results indicated that, in contrast to expectations, cognitive flexibility and children's epistemic cognition as assessed via the new methodology were not related.

Promoting curiosity to promote learning: A study of curiosity and question-asking

Presenting Author:Jamie Jirout, University of Virginia, United States

Many educators and researchers consider curiosity to be of high importance in early education and it is considered a "21st Century Skill" – learner and learning characteristics that do not fall into a specific academic domain but that are widely studied as priority areas across fields of study. There is reason to expect that instructional methods can promote curiosity, and students' curiosity can then support their learning. The current study explores whether instructional language to promote curiosity will lead to differential use of questioning in a problem-solving task, and whether children's question-asking on the problem-solving task relates to students' curiosity on an exploration task. Four- to Nine-year-old children completed a "zoo detective" task where they could use questions to learn the identity of a mystery animal, and a curiosity task where they could click on shapes to learn facts about different topics. Three different instructional languages were used, one emphasizing the detective role, one emphasizing a focus on what is unknown, and one emphasizing the usefulness of questions. All conditions elicited several questions on average, and the difference in questions asked across conditions was not significant. Children's exploration on the curiosity task was associated with their questions asked on the problem-solving task when controlling for age. Further analyses will explore the types of questions asked on the problem-solving task, patterns of exploration on the curiosity task, and information learned through exploration.

Do Cultural Background and SES Affect Preschoolers' Scientific Curiosity?

Presenting Author:Ornit Spoktor-Levy, Bar-Ilan University, Israel; **Co-Author:**Aisha Alzaro, Bar Ilan University, Israel; **Co-Author:**Yael Kesner Baruch, Beit Berl College, Kfar Saba, & Levinsky College of Education, Tel Aviv, Israel, Israel; **Co-Author:**Taly Shechter, Bar-Ilan University, Israel

The present study focuses on identifying and interpreting scientific curiosity, which can be defined as a desire to understand and a quest for knowledge regarding natural phenomena by implying inquiry processes. In previous studies, we sought to explore preschoolers' verbal and non-verbal responses during engagement in a set of tasks, called the Integrated Science Engagement Responsive Tasks (ISERT). We found that preschoolers exhibited a rich repertoire of verbal and non-verbal responses which in our view, provide a comprehensive insight into children's manifestations of scientific curiosity. In the current study we

ask: Do preschoolers (5-6 years of age) from different cultural background and socio-economic status (SES), respond differently while engaging with the ISERT? Our results show that preschoolers (N=60) from different SESs do respond differently while engaging with the ISERT. Children from low SES declare they are curious and like to explore however they perform inquiry capabilities and curiosity significantly lower than preschoolers from high SES. We also found that Arabic speaking children were significantly less active and responsive in the Active Exploration and Scientific Observation tasks compared to Hebrew speaking preschoolers. Does this infer that they are less curious? One way of explaining these differences is the variability in young children's cognitive and emotional developmental stage. Other explanations may be cultural differences and expected behaviors from children. Further studies should explore whether different patterns of responses can be identified with differing characteristics of young study participants. This might improve our understanding of identifying and encouraging scientific curiosity among young children.

Creativity in children as a situated skill

Presenting Author:Paul Leseman, Utrecht University, Netherlands; **Co-Author:**Marloes van Dijk, Utrecht University, Netherlands; **Co-Author:**Honghong Bai, Utrecht University, Netherlands; **Co-Author:**Elma Blom, Utrecht University, Netherlands; **Co-Author:**Hanna Mulder, Utrecht University, Netherlands; **Co-Author:**Evelyn Kroesbergen, Radboud University, Netherlands

Research into children's creativity has gained much interest in recent years, but what creativity is about is still a debated question. Most definitions regard creativity as a stable psychological trait. However, these definitions typically offer only a limited account of how environments can contribute to creativity and are therefore less informative for education purposes. Here we propose an alternative approach, based on Gibson's perception-action theory, by focusing on creativity as a situated process. We conducted two studies with preschool and primary school children using adapted versions of the Alternative Uses Task. In addition to the standard measures of fluency and originality derived from this task, we analyzed in-depth children's thinking processes and conducted a content analysis of the generated novel uses. The results suggest that perceived or simulated characteristics of the target objects and wider stimulus situation are used to construct original novel uses, supporting the notion of creativity as a situated skill.

Session C 14

23 August 2021 14:30 - 15:30

Session Room 6

Collaborative Workspace

Learning and Social Interaction

The Development of an Evaluation Framework in the Context of the "Schools as Living Labs" Project

Keywords: Assessment Methods and Tools, Communities of Learners, Communities of Practice, Science Education

Interest group: SIG 10 - Social Interaction in Learning and Instruction

This proposal concerns the presentation and discussion of an evaluation framework that was developed in the context of a European Union funded project titled SALL (Schools as Living Labs) with the express purpose to assess the impact of a living lab methodology as a new educational approach of added value for the development of open schooling activities linked to science learning. A modular evaluation framework was developed for the in-depth study of the 42 focus schools (year 1) and also for the design and implementation of living lab projects by 412 participating school communities during years 2 and 3 of the project. The goal of the in-depth study is to suggest improvements of the living lab methodology and also to refine the evaluation process for years 2 and 3 based on the findings of year 1. In the context of the collaborative space format that this proposal is submitted, we aim to share the methodology and the evaluation framework with interested researchers working in the same field, present the findings that will derive from the SWOT analysis (Strengths-Weaknesses-Opportunities-Threats), and request from the audience to provide their feedback and stances on emerging patterns and suggest new evaluation tools.

The Development of an Evaluation Framework in the Context of the "Schools as Living Labs" Project

Presenting Author:Yvoni Pavlou, University of Cyprus, Cyprus; **Co-Author:**Marios Papaevripidou, University of Cyprus, Cyprus; **Co-Author:**Pavlos Koulouris, Ellinogergermaniki Agogi, Greece; **Co-Author:**Zacharias Zacharia, University of Cyprus, Cyprus; **Co-Author:**Sofoklis Sotiriou, Ellinogergermaniki Agogi, Greece

This proposal concerns the presentation and discussion of an evaluation framework that was developed in the context of a European Union funded project titled SALL (Schools as Living Labs) with the express purpose to assess the impact of a living lab methodology as a new educational approach of added value for the development of open schooling activities linked to science learning. A modular evaluation framework was developed for the in-depth study of the 42 focus schools (year 1) and also for the design and implementation of living lab projects by 412 participating school communities during years 2 and 3 of the project. The goal of the in-depth study is to suggest improvements of the living lab methodology and also to refine the evaluation process for years 2 and 3 based on the findings of year 1. In the context of the collaborative space format that this proposal is submitted, we aim to share the methodology and the evaluation framework with interested researchers working in the same field, present the findings that will derive from the SWOT analysis (Strengths-Weaknesses-Opportunities-Threats), and request from the audience to provide their feedback and stances on emerging patterns and suggest new evaluation tools.

Session D 1

23 August 2021 15:45 - 16:45

Session Room 6

Single Paper

Higher Education, Teaching and Teacher Education

Mixed-Methods Research

Keywords: Communities of Practice, Computer-supported Collaborative Learning, Content Analysis, Higher Education, Informal Learning, Instructional Design, Knowledge Creation, Mixed-method Research, Multicultural Education

Interest group: SIG 04 - Higher Education, SIG 17 - Methods in Learning Research

Chairperson: Judith Gulikers, Wageningen University, Netherlands

Social Media contributes to a Sense of Community?! – A Case Study on Twitter

Keywords: Communities of Practice, Content Analysis, Informal Learning, Mixed-method Research

Presenting Author:Martin Rehm, Pädagogische Hochschule Weingarten, Germany; **Co-Author:**Daly Alan, University of California, San Diego, United States; **Co-Author:**Peter Bjorklund Jr., University of California, San Diego, United States

Scholars have become increasingly interested in the relationship between sense of community (SoC) and social capital. Furthermore, studies seem to suggest that the two concepts appear to be building blocks. In order to contribute to this discussion, and to add an educational science perspective, the current paper investigated whether a SoC can be traced in an online community. More specifically, we contrasted two Twitter discussions among teachers and educational professionals in the US, namely: i) on a district level, and ii) on a national level. Using sentiment analysis and opinion mining, we discovered that Twitter seems to be a place of support, connection, and content—all elements of a SoC and contributing to social capital formation.

The student-curriculum interplay: Diverse content in instructional materials and student performance

Keywords: Content Analysis, Higher Education, Mixed-method Research, Multicultural Education

Presenting Author:Marieke Meeuwisse, Erasmus University Rotterdam, Netherlands; **Co-Author:**Jana Vietze, Erasmus University Rotterdam, Netherlands; **Co-Author:**Joran Jongerling, Erasmus University Rotterdam, Netherlands; **Co-Author:**Rinotha Senathirajah, Erasmus University Rotterdam, Netherlands; **Co-Author:**Regina Sutrisno, Erasmus University Rotterdam, Netherlands

To reach equity in academic success of diverse students in higher education, the curriculum needs to provide comparable learning opportunities and

experiences for diverse students. Using mixed methods, this study explored the relation between diversity-related content integration in instructional materials (i.e., adequate representation, inadequate representation, and diversity-related content) and the academic performance of diverse students over the first-year in higher education. Thematic content analysis of 93 instructional documents and Generalized Additive Modeling with data from 93 students ($M_{age} = 19.88$; 90.3% female) revealed that courses with a high number of adequate representation of minority cultures and groups also had a high number of inadequate representation. Diversity-related content in materials mostly concerned ethnicity and SES-related content. Neither of the three content integration variables were related to students' performance over the first year in higher education. We discuss the potential of relating content integration to alternative academic success indicators in future research.

Development of Meta-Discourse through Portfolio Reflection in a Knowledge Building Environment

Keywords: Computer-supported Collaborative Learning, Instructional Design, Knowledge Creation, Mixed-method Research

Presenting Author: Yuyao Tong, The University of Hong Kong, China; **Co-Author:** Carol Chan, The University of Hong Kong, Hong Kong

This paper examines the design of a student-directed portfolio assessment design on students' engagement of the meta-discourse process and knowledge growth in a computer-supported knowledge building environment. Students used Knowledge Forum® (KF) – an online collaborative discussion space, to contribute and build-on ideas to advance collective knowledge through idea-centered discourse moves. The design of portfolio assessment includes writing electronic portfolio notes where they reflect on their knowledge building progress. Students' understanding of the nature of discourse and domain knowledge significantly increased from pre-test to post-test. Analyses on students writing of KF portfolio notes illustrated how they engaged in meta-discourse processes. Correlation analysis suggested that students' understanding of discourse, domain knowledge, KF meta-discourse moves, and portfolio notes were correlated. Hierarchical regression analysis indicated meta-discourse portfolio reflections and understanding of discourse contributed to domain knowledge over and above prior knowledge. Implications of scaffolding students engage in the meta-discourse process with portfolio notes are discussed.

Session D 2

23 August 2021 15:45 - 16:45

Session Room 12

Single Paper

Learning and Special Education

Special Primary Education

Keywords: Attitudes and Beliefs, Learning and Developmental Difficulties, Literacy, Primary Education, Self-efficacy, Special Education, Teaching/Instruction

Interest group: SIG 11 - Teaching and Teacher Education, SIG 15 - Special Educational Needs

Chairperson: Johanna Fee Ziemes, University of Duisburg-Essen, Germany

Individual prerequisites for children's attitudes towards peers with social-emotional disabilities

Keywords: Attitudes and Beliefs, Learning and Developmental Difficulties, Primary Education, Special Education

Presenting Author: Marwin Felix Loeper, Paderborn University, Germany; **Co-Author:** Frank Hellmich, Paderborn University, Germany

Children with special educational needs (SEN) in their social-emotional development represent a group at risk of social exclusion in inclusive education. Contrary to their peers without SEN, they have fewer friendships and social interactions in the classroom, and experience less social acceptance from their classmates (Avramidis, Avgeri, & Strogilos, 2018). Consequently, children with social-emotional SEN have limited participation opportunities inside and outside the inclusive classroom. In this context, children's attitudes towards peers with social-emotional SEN are crucial for the unconditional social participation of children with SEN in inclusive primary schools. Unfortunately, their attitudes towards peers with social-emotional SEN are significantly lower than towards peers with other disabilities (Schwab, 2015). By now, determinants of children's attitudes towards peers with social-emotional SEN – such as social self-concepts, empathy (perspective taking/empathic concern), or contact experiences with disabled peers – are not entirely clarified. In our study, we therefore surveyed $N=512$ third and fourth grade primary school students' attitudes towards peers with social-emotional SEN, their social self-concepts, their empathy (perspective taking/empathic concern), and their contact experiences. Whereas the results of a structural equation model indicate that students' attitudes towards peers with social-emotional SEN are significantly predicted by their contact experiences and empathic concern, they are unrelated to students' social self-concepts and their ability of perspective taking. However, children's ability of perspective taking and their empathic concern can be explained by their social self-concepts.

Determinants for teachers' intentions to manage heterogeneity in (non)-inclusive primary education

Keywords: Primary Education, Self-efficacy, Special Education, Teaching/Instruction

Presenting Author: Gamze Görel, Paderborn University, Germany; **Co-Author:** Marwin Felix Loeper, Paderborn University, Germany; **Co-Author:** Frank Hellmich, Paderborn University, Germany

Successful inclusive learning processes in primary schools require teachers' highly developed personal qualifications. On the basis of the 'Theory of Planned Behaviour' (Ajzen, 1991), teachers' intentions to deal with heterogeneity are explained by their attitudes towards inclusion, their self-efficacy beliefs, and significant other's expectations. The theory could be verified in several studies (e.g., Knauder & Koschschmieder, 2019). However, it is still unclear, if teachers with and without experiences from inclusive education differ in their intentions to deal with heterogeneity. Against this background, we investigated whether teachers from inclusive and non-inclusive schools differ in their intentions to deal with heterogeneity. In our study, $N=286$ primary school teachers (inclusive schools: $n=148$ teachers; non-inclusive schools: $n=138$ teachers) filled in a questionnaire on their attitudes, their self-efficacy beliefs, their perceived principals' expectations, and their intentions to deal with heterogeneity. In order to compare differences in the prediction of teachers' intentions to deal with heterogeneity depending on the type of school (inclusive vs. non-inclusive), we computed a multigroup analysis in Mplus and could prove scalar measurement invariance. Overall, our results indicate that there are significant differences in the prediction of primary school teachers' intentions to deal with heterogeneity depending on their type of school (inclusive vs. non-inclusive). Whereas the intentions of teachers from inclusive schools are predicted by their attitudes towards inclusion and their self-efficacy beliefs in our study, the intentions of teachers from non-inclusive schools are explained by their perceived principals' expectations and their self-efficacy beliefs.

Students' Online Reading Performance among Different Learners and their Reading Habits

Keywords: Learning and Developmental Difficulties, Literacy, Primary Education, Special Education

Presenting Author: Laura Kannainen, University of Jyväskylä, Finland; **Co-Author:** Carita Killi, Tampere University, Finland; **Co-Author:** Jukka Utriainen, University of Jyväskylä, Finland; **Co-Author:** Asko Tolvanen, University of Jyväskylä, Finland; **Co-Author:** Mikko Aro, University of Jyväskylä, Finland; **Co-Author:** Paavo H.T. Leppänen, University of Jyväskylä, Finland

This study examined online research and comprehension (ORC) performance profiles and their relation to reading habits in students with and without learning difficulties ($n = 436$; 206 girls; 12–13 years). First, students' ORC performance (locating, evaluating, synthesizing and communicating information) was measured with a validated web-based assessment that consisted of a simulated closed Internet environment and tasks measuring the different ORC skill areas. Seven ORC performance profiles were identified. Second, reading fluency as well as teacher-rated attention and executive function (EF) scores were used to form learner groups: 1) students with reading difficulties, 2) students with attention and EF difficulties, 3) students with comorbid difficulties in both reading and attention and EF, and 4) students without these difficulties, i.e. regular learners. Third, students' reading habits were assessed with a questionnaire asking how often they read different kinds of texts. Findings showed that students with learning difficulties were more likely to belong to the lower performance profiles, and all top performers were regular learners. However, 25.6% of students with reading difficulties and 16.2% of students with attention and EF difficulties performed at average or good levels. Finally, reading longer texts, such as books and blog postings, are more clearly associated with students' online reading performance than reading shorter texts, such as comics and forums.

Session D 3

23 August 2021 15:45 - 16:45

Session Room 5

Single Paper

Assessment and Evaluation, Cognitive Science

Reading Comprehension and Literacy

Keywords: Assessment Methods and Tools, Cognitive Skills, Language (L1/Standard Language), Literacy, Qualitative Methods, Reading Comprehension, Secondary Education

Interest group: SIG 01 - Assessment and Evaluation, SIG 22 - Neuroscience and Education

Chairperson: Brent Duckor, San Jose State University, United States

A construct modeling approach for a more valid and reliable embedded reading assessment

Keywords: Assessment Methods and Tools, Literacy, Qualitative Methods, Reading Comprehension

Presenting Author:Brent Duckor, San Jose State University, United States; **Co-Author:**Ágnes Hódi, MTA-SZTE, Hungary

To determine reading proficiency in educational settings, standardized assessment instruments have been developed. Despite the myriad reading tests and test administrations, scores yielded by these batteries rarely serve real development of the reader. Experts in reading argue that there are significant barriers to more valid and reliable assessments of reading development (Pearson, Valencia, & Wixson, 2014) beyond narrow "skills-based" approaches. Our research aims to overcome these barriers by building an argument for the "assessment of reading assessments" by examining current reading assessment instruments frequently administered in Europe and in the U.S. Based on what we know about the science and design of testing and how people learn (NRC, 1999, 2001), we carried out a systematic literature review guided by the Preferred Items for Systematic Reviews and MetaAnalysis (PRISMA) statement (Moher, Liberati, Tetzlaff, Altman, & ThePrismaGroup, 2009) to recover the vertices of the NRC triangle given its methodological strength as a means of establishing a comprehensive and reliable evidence base. We present findings from assessment frameworks, technical reports and sample item banks of three widely used reading assessment instruments (Lexile - Metametrics, 2015; PISA - OECD, 2019; Smarter Balanced Assessment - SBAC, 2015) and peer reviewed articles in major databases. Our findings lean towards "embedded reading assessment" protocols based upon the BEAR assessment system (Dray, Brown, Diakow, Lee, & Wilson, 2019; Wilson, 2005) that can serve as a generalizable model of embedded reading assessment instrument in authentic whole language contexts for learning.

READING STRATEGIES AND READING ACHIEVEMENTS IN THE MIDDLE SCHOOL: KAZAKHSTANI YOUNG LEARNERS

Keywords: Assessment Methods and Tools, Literacy, Reading Comprehension, Secondary Education

Presenting Author:Aigul Akhmetova, University of Szeged, Doctoral School of Education, Hungary; **Co-Author:**Gaysha Imambayeva, Innovative Eurasian University, Kazakhstan; **Co-Author:**Benő Csapó, University of Szeged, Hungary

Negligent results in reading literacy of Kazakhstani 15-year-old students in the reading literacy in Programme for International Students Assessment (PISA) (M=390 in 2009 to M=387 in 2018) could be worrisome for literacy development and quality of education (OECD, 2019). In order to understand this issue a diagnostic assessment of reading comprehension tests in three languages and the questionnaire in reading strategy among (n=1563) 6th and 8th grade learners were conducted in Pavlodar city among seven randomly chosen secondary schools in January- February, 2020. The aim of this study was to examine young adolescents' reading strategies while performing the tests in reading comprehension in English, Kazakh and Russian. Analysis of the results indicated that low results in reading tests in the languages (English: M=36%, SD=23.3%; Kazakh: M=51%, SD=29.8%; Russian: M=55%, SD=29.9%). However, the regression analysis showed that R-squared did not equal zero, albeit the correlation between the model and the dependent variables were statistically significant. This could probably be the existence of limited practice, lack of instruction of how to use more effective reading strategies while reading. Although applying other less effective reading strategies by young learners to comprehend reading tasks is obvious.

A first step of a new acquired reading skills assessment of adult Hungarian aphasic patients

Keywords: Cognitive Skills, Language (L1/Standard Language), Literacy, Reading Comprehension

Presenting Author:Orsolya Kis, University of Szeged Doctoral School of Education, Hungary; **Co-Author:**János Steklács, University of Pécs, SzIÉ, Kaposvár, Hungary, Hungary

Strong relation between language and reading had been revealed by behavioural and brain lesions studies. Acquired reading disorders may occur as a part of a global language deficit. The aim of our study was to explore the pattern of Hungarian aphasic patients' reading abilities and eye movement pattern. 21 adult aphasic patients participated in the study. Linguistic abilities were measure with the Hungarian version of Western Aphasia Battery. Reading skills were explore with a battery which had been created by us. In some cases during testing eye tracking device was used. Our data showed that the severity of linguistic impairment had a strong impact on reading abilities and eye movements as well. Moderate aphasic patients had significantly worse performance in 11 tasks out of 12 and performed more eye movements than mild aphasic patients. Our data can help to get a better insight into the characteristics of Hungarian reading and linguistic abilities to have a more individualized language therapy with better outcome.

Session D 4

23 August 2021 15:45 - 16:45

Session Room 10

Single Paper

Cognitive Science, Educational Policy and Systems

Cognitive Development

Keywords: Cognitive Development, Cognitive Skills, Early Childhood Education, Educational Psychology, Learning Disabilities, Meta-analysis, Parental Involvement in Learning, Social Development

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 15 - Special Educational Needs

Chairperson: Jasperina Brouwer, University of Groningen, Netherlands

Media use of toddlers and implications for sleep: a differentiated story

Keywords: Cognitive Development, Early Childhood Education, Educational Psychology, Parental Involvement in Learning

Presenting Author:Sigrid Hackl-Wimmer, University of Graz, Austria; **Co-Author:**Marina Eglmaier, Institute of Psychology, University of Graz, Austria; **Co-Author:**Helmut Lackner, Otto Loewi Research Center, Medical University Graz, Austria; **Co-Author:**Lars Eichen, University of Graz, Austria; **Co-Author:**Ilona Papousek, Institute of Psychology, University of Graz, Austria; **Co-Author:**Karoline Rettenbacher, Institute of Psychology, University of Graz, Austria; **Co-Author:**Christian Rominger, Institute of Psychology, University of Graz, Austria; **Co-Author:**Catherine Walter-Laager, Department of Educational Sciences, University of Graz, Austria; **Co-Author:**Manuela Paechter, University of Graz, Austria

Already for toddlers use of digital media is an integral part of their daily lives. In a US-American study, 96% of participating parents with children between 6 months and 4 years old stated that their children own at least one digital device (smart phone, notebook, tablet PC, etc.). In the perception of the public, such early media use is mostly associated with detrimental effects on children's cognitive, emotional, and motor development. Also, sleep is assumed to be negatively affected by media use. A sample of parents with toddlers in daycare filled in a questionnaire on their children's media use, educational styles and aims, etc. Heart rate of the toddlers was recorded using a small portable ECG device (eMotion Faros180) which included a 3D acceleration sensor for recording of movements. ECG monitoring started on workdays when the toddlers attended daycare with a scheduled duration of 30-33 hours. Altogether, the toddlers' length of media use was rather low: 68.62% of them had no access to tablet PCs; 46.30% refrained from use of mobile phones. Only print media were widely

employed. The results show opposite effects of media devices. Use of mobile phones is negatively related with sleep quality while there is a positive relationship between use of audio media (Toniebox, recorder, etc.) and sleep quality. These results might be explained by different characteristics of media and by the circumstances and educational aims with which they were used in the family.

Inclusive education of students with general learning difficulties: A meta-analysis

Keywords: Cognitive Development, Learning Disabilities, Meta-analysis, Social Development

Presenting Author:Sonja Krämer, Christian-Albrechts-University of Kiel, Germany; **Co-Author:**Jens Möller, Christian-Albrechts-University of Kiel, Germany;

Co-Author:Friederike Zimmermann, Kiel University, Germany

This submission presents a meta-analysis on cognitive (e.g., academic performance) and psychosocial outcomes (e.g., self-concept, wellbeing) among students with general learning difficulties and their peers without learning difficulties in inclusive vs. segregated educational settings. In total, we meta-analyzed $k = 40$ studies with 428 effect sizes and a total sample of $N = 11,987$ students. We found a significant small to medium positive effect for cognitive outcomes of students with general learning difficulties in inclusive vs. segregated settings ($d = .35$) and no effect on psychosocial outcomes ($d = .00$). Students without learning difficulties did not differ cognitively ($d = -.08$) or psychosocially ($d = .06$) from their counterparts in segregated settings. We examined several moderators (e.g., study design, school level, clarity of diagnosis, subtype of outcome). We discuss possible selection effects as well as implications for future research and practice.

Relations Between Socioeconomic Status, Stress, Parenting, and Working Memory

Keywords: Cognitive Development, Cognitive Skills, Early Childhood Education, Parental Involvement in Learning

Presenting Author:Kerry Lee, The Education University of Hong Kong, Hong Kong

Though socioeconomic differences in working memory are observed even in early childhood, what produces these early differences remain unclear. I examined the relations between socioeconomic status, working-memory, and several mediating variables in Hong Kong, which has substantial wealth inequality but a relatively moderate academic achievement gap. A sample of 258 children was administered a battery of working memory tests. Their parents completed a questionnaire that asked about different facets of socioeconomic status and included measures of economic worries, parental stress, mental health, parenting style, happiness, and home affordances. The results revealed significant socioeconomic differences in working memory. Structural equation model suggests that their relation is effected through a multi-layered set of relations involving worries about the children's economic future, parenting stress, and permissive parenting style. The findings provide additional refinements to the family stress model and point to new avenues for future research.

Session D 5

23 August 2021 15:45 - 16:45

Session Room 13

Single Paper

Higher Education

Mixed-Method Research in Higher and Doctoral Education

Keywords: Comparative Studies, Doctoral Education, Emotion and Affect, Higher Education, Instructional Design, Mixed-method Research, Morality, Social Sciences, Synergies between Learning; Teaching and Research

Interest group: SIG 04 - Higher Education, SIG 24 - Researcher Education and Careers

Chairperson: Carmen Heckmann, Goethe University Frankfurt, Germany

Between recognition and exclusion: refugee students in higher Education – Austria's MORE-Initiative

Keywords: Higher Education, Mixed-method Research, Morality, Social Sciences

Presenting Author:Robert Moosbrugger, Johannes Kepler University Linz, Austria; **Co-Author:**Dimitri Prandner, Johannes Kepler University Linz, Austria

Programs like MORE evolved in reaction to the refugee crisis in 2015. Universities organized programs to accommodate asylum seekers and refugees on campus, therefore providing opportunities to take up studies (again). The case of the Austrian MORE initiative is used to discuss what kind of bonds refugee students see between themselves, the universities and the host society and the potentials of higher education and initiatives for refugees in this process. Based on subjective perceptions of recognition within and outside the university solidarity becomes an empirical question. Building on two main datasets (survey data as well as in depth interviews based on the results of the survey data) it can be stated, that finding places in a new society is a multifaceted process. Refugee students are in danger of not being recognized as their traits and competences fall back behind the attribute of being a refugee. Beside legal restrictions and a lack of resources existing prejudices and a migrant-sceptic surrounding counteract the efforts of the refugee students to become capable of acting in new surroundings. Against this background the importance of initiatives like MORE in the context of higher education becomes evident. They offer opportunities for some kind of normalization and recognition re-establishing capacities to act for a group of people excluded from diverse opportunities.

Developing a Course Experience Questionnaire (CEQ) for evaluating teaching and learning aspects

Keywords: Higher Education, Instructional Design, Mixed-method Research, Synergies between Learning; Teaching and Research

Presenting Author:Kaire Uiboleht, University of Tartu, Estonia; **Co-Author:**Astra Schults, University of Tartu, Institute of Psychology, Estonia; **Co-Author:**Irene-Angelica Chountac, University of Tartu, Institute of Education/Institute of Computer Science, Estonia

Issues of validity and reliability of Course Experience Questionnaires (CEQ) as instruments are often raised. Moreover, the understanding of what constitutes good teaching and learning has changed. To that end, we introduce a new CEQ instrument, which is developed by reviewing recent studies in teaching and learning in higher education and by using a variety of procedures to enhance the validity and reliability of the instrument. As a result, we found partial support for the Lawson and Lawson (2013) engagement model as students' personal disposition and learning environment both contribute to the engagement and the conditions for engagement had also a direct effect on the results of learning.

Finnish and Danish doctoral students' academic emotions

Keywords: Comparative Studies, Doctoral Education, Emotion and Affect, Mixed-method Research

Presenting Author:Henrika Anttila, University of Helsinki, Finland; **Co-Author:**Jenni Sullanmaa, University of Tampere, Finland; **Co-Author:**Kirsi Pyhältö, University of Helsinki, Finland

Studying for doctoral degree has been described as an emotional rollercoaster. Still empirical research has been scarce. The aim of this study is to gain a better understanding on academic emotions in doctoral education by focusing on both positive and negative emotional experiences in different activities of doctoral education. Furthermore, the aim is to identify temporal emotional patterns related to doctoral experience and provide added value to the knowledge on emotional patterns by cross-country comparison. Altogether 272 Danish and Finnish doctoral students participated in the study. The data was collected with the *Cross-Country-Doctoral Experience* survey and both qualitative and quantitative analysis procedures were utilised. Our preliminary results suggested that doctoral journey is filled with emotions, both positive and negative emotional experiences. The results also imply that different emotions are reported in different time points of the studies and that there are differences between the Danish and Finnish doctoral students. This study contributes to the literature by providing more comprehensive understanding on doctoral students emotions, the activities they are embedded in and the temporal patterns of the emotions.

Session D 6

23 August 2021 15:45 - 16:45

Session Room 2

Single Paper

Educational Policy and Systems, Learning and Instructional Technology

Artificial Intelligence

Keywords: Artificial Intelligence, Assessment Methods and Tools, Conversation/Discourse Analysis, Educational Policy, Educational Technology, Quantitative Methods, Science Education

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Maria Tulis, University of Salzburg, Austria

Investigating three types of cognitive load when learning with an AI-enriched biology textbook

Keywords: Artificial Intelligence, Educational Technology, Quantitative Methods, Science Education

Presenting Author: Marta Koć-Januchta, Linköping University, Sweden; **Co-Author:** Konrad J. Schönborn, Linköping University, Sweden; **Co-Author:** Lena A. E. Tibell, Linköping University, Sweden

Rapid developments in educational technology awaken hopes for making learning more engaging and effective. At the same time, Cognitive Load Theory stresses limitations of human cognitive architecture and urges developers to design learning tools that help learners optimize their mental capacities. In a 1.5-month long study we investigated tertiary students' use of an AI-enriched digital biology book comprising a 5000-concept knowledge base and algorithms that offer the possibility to ask questions and receive answers. Our aim was to identify and investigate differences between three types of cognitive load (CL), namely, intrinsic (ICL), germane (GCL) and extraneous (ECL), as well as their correlation with learning gain and usability perception. Findings show that non-optimal design, which draws learners' cognitive resources from the task is linked with a lower learning gain and user satisfaction. The study contributes to new approaches on differentiating between cognitive load types and their relationship with learning from digital tools. The findings also emphasize the importance of optimally designing emerging educational technologies.

Efficient Automatic Coding of PISA Text Responses: Learning from Previous Assessments

Keywords: Artificial Intelligence, Assessment Methods and Tools, Educational Technology, Quantitative Methods

Presenting Author: Fabian Zehner, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:** Frank Goldhammer, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:** Nico Andersen, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:** Julia Mang, TUM School of Education, Germany

Automatic coding (e.g., scoring) of short-text responses allows to tackle many challenges associated with constructed-response format in assessment. PISA's tests (the *Programme for International Student Assessment*, OECD, 2017) contain substantial numbers of items requiring human coding (26–45% in 2015). In this presentation, we outline historical developments in automatic coding and depict the methodology behind the software package ReCo (Automatic Text Response Coder; Zehner, Sälzer, & Goldhammer, 2016). Additionally, we report on a new study investigating whether once trained classifiers can be reused in repeated measurements. This is crucial because automatic coding's promise of increased consistency and efficiency can only reach the operational level if classifiers can be reused across repeated measurements with sufficient accuracy and robustness towards study design changes. We investigated the difference in accuracy of classifiers that had been trained on data from PISA 2012 (Zehner et al., 2016) when applied to PISA 2012 and 2015. The data included $n = 54,190$ German responses to ten items. Results indicate a substantial decrease in accuracy for only one (mathematics) item ($\Delta k = -.188$), while the other nine items ranged within $\Delta k = [-.101, +.081]$. Neglecting the mathematics item, no aggregated decrease could be found. The presentation discusses required control mechanisms for potential operational employment.

Educational Datafication in Policy and Practice- Interoperability as Key in Sweden

Keywords: Artificial Intelligence, Conversation/Discourse Analysis, Educational Policy, Educational Technology

Presenting Author: Svea Kiesewetter, University of Gothenburg, Sweden; **Co-Author:** Annika Bergviken Rensfeldt, University of Gothenburg, Sweden; **Co-Author:** Thomas Hillman, University of Gothenburg, Sweden; **Co-Author:** Sofia Serholt, University of Gothenburg, Sweden

Datafication practices, i.e., the transformation of social actions and practices into machine ready, quantified digital data has become a central and integral part of daily school practice. In the case of Sweden, ambitions to drive digitalization in education forward have become increasingly visible in educational policy from entities such as the Ministry of Education, the Swedish Data Protection Authority and the Swedish Association of Local Authorities and Regions. This study aims at understanding teachers' enacted and datafied practices, drawing on the theoretical framing of policy assemblages. Working with a large collection of sources, this paper analyzes a selection of key policy documents and interviews with stakeholders. Through unpacking the policy assemblages, interoperability and the lack thereof is shown to be a key aspect of datafication. The results suggest that teachers' work has shifted and increased when taking data-driven approaches to established practices, while pedagogical value is often overlooked. Overall, the discourse on datafication and interoperability in particular promotes ideals of efficiency and ease-of-use, but this study suggests a mismatch between the intended purposes of data practices and their actual use as part of teachers' daily practices.

Session D 7

23 August 2021 15:45 - 16:45

Session Room 4

Single Paper

Assessment and Evaluation, Learning and Instructional Technology, Teaching and Teacher Education

Educational Technology and Mixed-method Research

Keywords: Assessment Methods and Tools, Educational Technology, Higher Education, Instructional Design, Learning Analytics, Mixed-method Research, Student Learning

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education

Chairperson: Tobias Halbherr, ETH Zurich, Switzerland

Encouraging Students' Autonomy, Competence and Satisfaction: the Role of Learning Analytics

Keywords: Educational Technology, Instructional Design, Learning Analytics, Mixed-method Research

Presenting Author: Elise Ameloot, Ghent University, Belgium; **Co-Author:** Bart Rienties, Open University, United Kingdom; **Co-Author:** Tijs Rotsaert, Ghent University, Belgium; **Co-Author:** Tammy Schellens, Ghent University, Belgium

In a blended learning environment (BLE) it is important to support students' basic needs for autonomy and competence, and students' satisfaction. However, a BLE poses challenges to university teachers to monitor and support students' online behavior. Learning Analytics (LA) can, among others, be used to improve university teachers insight into students' online activities. The general goal of this quasi-experimental study is to investigate the impact of an LA intervention by university teachers on students' basic need for autonomy and competence and students' satisfaction. In the LA intervention, university teachers shared common and distinctive LA trends with the students and adapted the face-to-face instruction based on the information from the LA data. This study was conducted in an authentic BL context in university-based teacher education. The intervention study was performed over a period of three months using a mixed-method approach (N=348 students). Results were mostly mixed for students' basic need satisfaction for autonomy and competence, depending on the context. With regard to students' satisfaction, the results showed that students of the experimental condition were more satisfied with the learning environment compared to students in the control condition and referred to the university teachers' LA-based adaptations as an added value. Important recommendations for the use of LA are outlined.

Validity and Learning in Resource-Rich Assessment: Convergent Evidence from Three Empirical Studies

Keywords: Assessment Methods and Tools, Educational Technology, Higher Education, Mixed-method Research

Presenting Author:Tobias Halbherr, ETH Zurich, Switzerland

In contrast to conventional resource-poor assessments, resource-rich assessments provide students access to resources such as disciplinary tools or task-relevant information. Resource-rich assessments may improve assessment validity and assessment-driven learning. This paper discusses convergent findings on resource-rich assessments in computer science from three independent empirical studies: two in-class experimental studies and one quasi-experimental study in an actual for-credit high-stakes examination. The three studies were deliberately designed to address the concern of robust and replicable findings, by systematically varying construct operationalizations and experimental versus ecological study settings. The findings indicate two distinct yet intertwined subcomponents to programming competency: Competency in coordinating with the disciplinary tool and Conceptual Competency. Tool-mediated tasks proved sensitive to both Conceptual Competency and Coordination Competency, resource-poor tasks only to Conceptual Competency. Conversely, information-mediated tasks proved uniquely sensitive to Conceptual Competency. Equally importantly, resource-rich tool-mediated learning and examination preparation was associated with consistent positive effects on students' learning outcomes. The findings were substantiated across all three empirical studies, speaking strongly to their dependability, generalizability, and transferrability to educational practice. In sum, the findings indicate the potential for substantial improvements in both validity and assessment-driven learning upon transitioning from a resource-poor assessment practice towards a practice that is more resource-rich.

Student Engagement in the Lockdown Period - A Mixed Methods Approach in Swiss Teacher Education

Keywords: Educational Technology, Higher Education, Mixed-method Research, Student Learning

Presenting Author:Franziska Zellweger, Zurich University of Teacher Education, Switzerland; **Co-Author:**Mirjam Kocher, University of Education Zurich, Switzerland

This project investigated the distance learning experiences of the diverse student body in two teacher education institutions in Switzerland. Student engagement has been long studied (e.g., Kahu & Nelson, 2018; Krause & Coates, 2008; Kuh, 2009), however researching the behavioural, cognitive and emotional engagement of students under the extraordinary circumstances have the potential to better understand student needs as well as chances and risks of distance learning. What student characteristics and qualities of the learning environments contribute to student engagement? A survey at two institutions of teacher education as well as interviews with students over three points in time suggest that students generally coped well with the situation. Contrary to expectations, there exist no significant differences between students enrolled part-time and full-time programmes or by institution. However, within the programmes a substantial variance among students is visible regarding the experienced level of stress, learning-related emotions and satisfaction with their own engagement. Psychosocial influences of students, the quality of the learning environment as well as student-faculty interaction contribute to the explanation of student satisfaction with their engagement in distance learning.

Session D 8

23 August 2021 15:45 - 16:45

Session Room 11

Single Paper

Instructional Design, Teaching and Teacher Education

Phenomenography and Mathematics

Keywords: Competencies, Design-based Research, Instructional Design, Mathematics, Numeracy, Phenomenography, Primary Education

Interest group: SIG 09 - Phenomenography and Variation Theory

Chairperson: Carla Oonk, Wageningen University, Netherlands

Teaching a structural approach as an outset for learning subtraction bridging through ten

Keywords: Design-based Research, Instructional Design, Mathematics, Phenomenography

Presenting Author:Angelika Kullberg, University of Gothenburg, Sweden; **Co-Author:**Tuula Maunula, University of Gothenburg, Sweden; **Co-Author:**Ulla Runesson Kempe, Jönköping University, Sweden

For more than thirty years it has been advocated that counting strategies is the path to learning arithmetic skill in early grades. In recent studies questions are raised about whether the early counting strategies taught (e.g. counting on from the larger operand) may hinder pupils' learning of more advanced strategies. The aim of this paper is to show how an alternative structural approach to teaching numbers and arithmetic problem solving from the outset affect first grade pupils' learning. In this study a group of four teachers and a group of researchers worked together during a one-year long teaching intervention that implemented activities based on identified critical aspects for perceiving numbers part-whole relations when solving subtraction tasks like $13-5=$. The intervention group consisted of 91 pupils, and 40 pupils were part of a comparison group. The results on addition and subtraction items in the number range 1-20 in pre- and post-interviews showed significant difference between the intervention and comparison group. Our analysis also shows that pupils' success in solving addition and subtraction items was related to how they solved the items, and whether they used part-whole reasoning, or counted single units to solve the items. The findings may have significant impact on teaching arithmetic in early grades.

The meaning of number relations: 7-yearolds solving subtraction tasks

Keywords: Competencies, Mathematics, Numeracy, Phenomenography

Presenting Author:Camilla Björklund, University of Gothenburg, Sweden; **Co-Author:**Ulla Runesson Kempe, Jönköping University, Sweden

The present investigation aims to contribute to knowledge of elementary arithmetic skills by focusing on what number relations students discern when solving subtraction tasks. The specific research question is: How are number relations discerned by 7-yearolds solving subtraction tasks and what becomes necessary to discern to enact powerful and developable arithmetic strategies when carrying over ten? Forty-nine Swedish Grade 1 students were observed to solve an orally given subtraction task within the number range 1-15 by using strategies informed by structuring the numbers in the task in some kind of part-whole relation. This was taken as an indication of their abilities to compose and decompose numbers and make use of a part-whole relation. The students were also observed solving a task in a larger number range ($32-25=$), which was analysed to reveal how they experience number relations and make use of these in novel situations. The analysis was informed by Variation theory of learning (Marton, 2015), focusing what came in the fore of attention for the students when solving the subtraction task, specifically how different ways of experiencing the task's number relations impact on their arithmetic solving skills. Results show that to enact powerful unit-composing strategies is determined by the ability to foreground both relations within and between numbers simultaneously, to know what part(s) to de-compose and re-compose to solve the task. These results have significance in that the strategy use can be expressions of different understanding of number relations, with implications for arithmetic learning and teaching.

Different opportunities to learn subtraction bridging through ten in grade 1

Keywords: Mathematics, Numeracy, Phenomenography, Primary Education

Presenting Author:Anna-Lena Ek Dahl, Jönköping University, Sweden; **Co-Author:**Maria Nord, University of Gothenburg, Sweden; **Co-Author:**Angelika Kullberg, University of Gothenburg, Sweden

Teaching addition and subtraction using 10 as a benchmark is seen as a powerful strategy for advancing pupils' learning of arithmetic skills when solving tasks like $13-5$. Using 10 as a benchmark for solving the task entails for example that the pupils need to be aware of that 5 can be partitioned into 3 and 2, and that the task may be solved in two steps, $13-3=10$, and $10-2=8$. In this study two lessons in two grade 1 classes, taught by different teachers, are analyzed on a fine-grained level. Our aim is to exemplify and discuss how 10 as a benchmark is used in teaching subtraction bridging through ten and what that may imply for pupils' learning. Our research question is; What different opportunities to learn '10 as a benchmark' are offered in two lessons of subtraction in the number range of 1 to 20? Variation theory (Marton, 2015) is the theoretical framework used for analysis. The analysis shows how different opportunities to learn subtraction bridging through ten are offered in the lessons by the aspects of the content brought to the fore for the pupils to experience.

Session D 9

23 August 2021 15:45 - 16:45

Session Room 8

Single Paper

Higher Education, Instructional Design

Communities of Learners in Higher Education

Keywords: Communities of Learners, Computer-assisted Learning, E-Learning/Online Learning, Higher Education, Instructional Design, Mixed-method Research

Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Ida Kukliansky, Ruppin Academic Center, Israel

Validating the Community of Inquiry Framework in the COVID-19 Semester: A Mixed-Method Study

Keywords: Communities of Learners, E-Learning/Online Learning, Higher Education, Mixed-method Research

Presenting Author: Mutlu Sen Akbulut, Bogazici University, Turkey; **Co-Author:** Duygu Umutlu, Bogazici University, Turkey; **Co-Author:** Diler Oner, Bogazici University, Turkey; **Co-Author:** Serkan Arikan, Bogazici University, Turkey

This mixed-methods study was conducted to validate the factor structure of the Community of Inquiry (CoI) framework in the COVID-19 semester (Spring 2020). Spring 2020 is typically characterized as an emergency remote teaching (ERT) period, distinguished from purposely designed instruction for online teaching and learning. To examine the usefulness of the CoI framework for understanding undergraduate students' online learning experiences in the ERT period, the authors collected quantitative data using the CoI survey at a large public university in Turkey. Further, they explored the CoI indicators that emerged in remote courses during ERT analyzing qualitative interview data. The structural equation modeling analyses indicated that teaching presence predicted social and cognitive presence in the ERT period more significantly than it did in the studies conducted in regular online education settings. The qualitative findings showed that the courses where teaching presence was high were evaluated as effective by the participants even if their cognitive and social presence was relatively low. These findings suggested that instructors should prioritize maximizing teaching presence in times of emergency.

Toward critical thinking using the Community of Inquiry framework in university online teaching

Keywords: Communities of Learners, E-Learning/Online Learning, Higher Education, Instructional Design

Presenting Author: Eva Kaczko, University of Innsbruck, Austria; **Co-Author:** Annette Ostendorf, University of Innsbruck, Austria

The Community of Inquiry (CoI) framework was developed for online university teaching twenty years ago and explicitly focuses on linking professional education and critical thinking skills through text-based communication. However, empirical research to date makes us sceptical about whether instructors/designers can sufficiently foster critical thinking skills using the framework. Through a conceptual "didactic" analysis of the theoretical framework's premises with a particular focus on methods in teaching-learning processes, we show which key elements are relevant to promote critical thinking in university teaching based on the CoI framework. We highlight the possibilities and limitations that arise from the premises and computer-mediated focus of the framework itself, the role of teachers and instructional designers, and the institutional framing. We also draw attention to the fact that the CoI framework is designed to promote reflective thinking processes, but not so much to develop critical thinking skills in enabling 'higher-order thinking' (according to Lipman), and what consequences this has for course design. Furthermore, we clarify that critical thinking processes are more than problem-solving processes and social constructions of knowledge. As a result of this analysis, we present a catalogue of questions that can help designers of online courses using the CoI framework to enhance critical thinking skills within higher education professionalisation.

Online learning practices and affordances in undergraduate education: a mixed method study

Keywords: Computer-assisted Learning, E-Learning/Online Learning, Higher Education, Mixed-method Research

Presenting Author: Andres Araos, University of Oslo - IPED, Norway; **Co-Author:** Crina Damsa, University of Oslo, Norway

This study explores the online learning practices (OLPs) of computer and software engineering students as they use online resources identified as relevant for professional software development. Previous research has mostly focused on examining online learning when included in the formal curriculum, and consequently there is insufficient empirical knowledge of how online resources provide students learning affordances. Students enact OLPs by carrying out purposeful actions in which they interact with people and online resources. Affordances represent what these people (e.g. professional programmers or other students) and online resources enable the students to do. This study aims at examining the learning affordances and purposes behind the OLPs of 16 computer and software engineering students in Norway. Different types of data, i.e., digital traces, interviews, course documents and self-reports, were collected about students' use of different specialized websites during a semester, and about the students' purposes for using them. The resulting data was analyzed through combined content analysis and multilevel latent class analysis. The findings reveal a complex ecology of practices (purposes and actions), people and online resources that provided students several interrelated learning affordances. The use of online resources not only varied based on the students' purposes, actions and their experience, the students' purposes and actions were also influenced in different ways by the people and online resources involved. The findings suggest that offering support for the use of online resources could help students in their learning efforts, and that further work is needed to inform practice.

Session D 10

23 August 2021 15:45 - 16:45

Session Room 9

Single Paper

Learning and Instructional Technology

Experimental Studies in Multimedia Learning

Keywords: Computer-assisted Learning, Conceptual Change, Educational Technology, Experimental Studies, Instructional Design, Metacognition, Multimedia Learning

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 16 - Metacognition

Chairperson: Salome Wagner, University of Tübingen, Germany

Do Refutation Texts Foster Teachers' Conceptual Change? Only When Designed in a Personalized Way

Keywords: Conceptual Change, Experimental Studies, Instructional Design, Multimedia Learning

Presenting Author: Anna-Sophia Dersch, Justus-Liebig-Universität Gießen, Germany; **Co-Author:** Alexander Renkl, Educational and Developmental Psychology Albert-Ludwigs-Universität Freiburg, Germany; **Co-Author:** Alexander Eitel, University of Giessen, Germany

Research has shown that teachers hold misconceptions about multimedia learning (e.g., multimedia instruction needs to be adapted to students' learning styles). We analyzed how to initiate teachers' conceptual change by different kinds of refutation texts. Common refutation texts are typically designed for novices. We designed a computer-based procedure providing teachers with personalized refutation texts in response to their specific misconceptions. To test whether such personalized refutation texts are effective, we presented N=129 in-service teachers either with 1) an expository text (without refutation), 2) a refutation text, or 3) a personalized refutation text. Teachers filled in a misconception questionnaire before and after the instruction assessing their conceptual change. Personalized refutation texts achieved the strongest conceptual change driven by increased feelings of guilt and shame. Common refutation texts did not foster teacher conceptual change as compared to expository texts. These findings indicate that refutation texts should be personalized for experienced practitioners like teachers. Further research should test to which extent this finding also applies to other groups of experienced learners.

MetaTutor-IVH Performance and Gaze Behaviors Predicted through Metacognitive Judgments

Keywords: Educational Technology, Experimental Studies, Metacognition, Multimedia Learning

Presenting Author:Megan Wiedbusch, University of Central Florida, United States; **Co-Author:**Roger Azevedo, University of Central Florida, United States

Multimedia environments can foster emerging self-regulatory skills and the effective utilization of learning strategies that are critical for domain knowledge acquisition. Using eye-gaze behaviors and log files, we examined the relationship of performance and prompted micro-level metacognitive judgments and their accuracy in a multimedia learning environment that taught 60 college students about nine human body systems. Results indicated that ease of learning (EOL) judgments are predictive of how much time is spent fixating on multimedia content. Additionally, the less accurate participants were in their EOL metacognitive judgment, the more likely they were to perform poorly on a multiple-choice question. Our results suggest that metacognitive judgments embedded in multimedia learning environments can be used to help predict not only performance-based metrics but also learner's eye-gaze behaviors (i.e., time spent looking at instructional content).

The Effects of (Un)Supportive Gaze Cues in Video Modelling Examples on Learning and Attention

Keywords: Computer-assisted Learning, Experimental Studies, Instructional Design, Multimedia Learning

Presenting Author:Tim van Marlen, Utrecht University, Netherlands; **Co-Author:**Suzanne Gerritsen, Utrecht University, Netherlands; **Co-Author:**Bob Timmer, University Utrecht, Netherlands; **Co-Author:**Vincent Hoogerheide, Utrecht University, Netherlands; **Co-Author:**Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

In video modelling examples, instructors demonstrate how to perform a task to learners. People tend to look at other people's faces and follow another person's gaze. Thus, gaze cues produced by an instructor can redirect attention to task-relevant aspects hereby establishing joint attention between an instructor and the learner in order to enhance learning. In addition to gaze cues, learner's spatial ability might be important in video modelling examples since learners have to transform tasks from third-person video perspective to first-person task perspective. Given that previous studies found mixed support regarding the effect of gaze cues on learning and often did not include a task that relies on spatial abilities this study investigated the effects of spatial abilities and (un)supportive gaze cues in video modelling examples on learning. In Experiment 1, 128 Dutch adults participated online ($M_{Age} = 23.55$, $SD = 3.53$) and watched a video modelling example about assembling an electrical circuit with either supportive or unsupportive gaze cues and afterwards performed a component and construction task about the electrical circuit. Given the spatial nature of the task spatial ability was examined as a moderator. No significant differences were found between the two conditions in performance on both the component ($p = .09$) and construction task ($p = .43$). Spatial ability only significantly affected the performance on the component task ($p = .003$). Experiment 2 will be conducted in the lab to collect eye-tracking data of the learner to investigate the effect of gaze cues on the learner's attention.

Session D 11

23 August 2021 15:45 - 16:45

Session Room 7

Workshop

Learning and Instructional Technology

Teaching students how to construct and use diagrams

Keywords: Cognitive Skills, Comprehension of Text and Graphics, Educational Psychology, Teaching Approaches

Interest group: SIG 02 - Comprehension of Text and Graphics

The ability to construct and use multiple and varied forms of representations, such as diagrams, is generally considered important to develop. Self-generated drawings/diagrams are effective not only in promoting deeper processing in learning, but can also facilitate more successful problem solving and communication. Research however reveals that students do not always benefit from diagram use. A likely contributor to this problem is that, in most formal education settings, students are rarely taught skills in diagram use. They may be shown diagram use through instructional materials and teachers' explanations but, generally, explicit instruction and/or guidance is not provided. Arguably, much of the negative outcomes of diagram use that have been reported in research can be attributed to participants' lack of necessary knowledge/skills for such use. In this workshop, therefore, we will demonstrate a few methods for cultivating students' diagram use skills, and provide opportunities for workshop participants to experience the application of those methods through guided tasks/exercises. The methods deal with scaffolding to facilitate understanding of the connection between concrete objects/entities and more abstract diagrammatic representations, promotion of spontaneity in diagram use, and development of understanding of the functions that diagrams can serve to match communicative purposes. The methods have been developed for a range of students, from beginner learners to undergraduate university students. Our intention is to get participants to appreciate the relevance/usefulness of diagram use instruction for the entire formal education process, and to consider the need to address important issues, including further research and development of instructional methods.

Teaching students how to construct and use diagrams

Presenting Author:Emmanuel Manalo, Kyoto University, Japan; **Presenting Author:**Yuri Uesaka, The University of Tokyo, Japan

The ability to construct and use multiple and varied forms of representations, such as diagrams, is generally considered important to develop. Self-generated drawings/diagrams are effective not only in promoting deeper processing in learning, but can also facilitate more successful problem solving and communication. Research however reveals that students do not always benefit from diagram use. A likely contributor to this problem is that, in most formal education settings, students are rarely taught skills in diagram use. They may be shown diagram use through instructional materials and teachers' explanations but, generally, explicit instruction and/or guidance is not provided. Arguably, much of the negative outcomes of diagram use that have been reported in research can be attributed to participants' lack of necessary knowledge/skills for such use. In this workshop, therefore, we will demonstrate a few methods for cultivating students' diagram use skills, and provide opportunities for workshop participants to experience the application of those methods through guided tasks/exercises. The methods deal with scaffolding to facilitate understanding of the connection between concrete objects/entities and more abstract diagrammatic representations, promotion of spontaneity in diagram use, and development of understanding of the functions that diagrams can serve to match communicative purposes. The methods have been developed for a range of students, from beginner learners to undergraduate university students. Our intention is to get participants to appreciate the relevance/usefulness of diagram use instruction for the entire formal education process, and to consider the need to address important issues, including further research and development of instructional methods.

Session D 12

23 August 2021 15:45 - 16:45

Session Room 1

Espresso Invited Symposium

Educational Policy and Systems, Motivational, Social and Affective Processes, Teaching and Teacher Education

SIG 18: Educational Effectiveness and Improvement during COVID-19: Challenges and Lessons.

Keywords: Achievement, E-Learning/Online Learning, Educational Policy, Motivation, Quantitative Methods, School Effectiveness, Teacher Professional Development, Teaching/Instruction, Workplace Learning

Interest group: SIG 18 - Educational Effectiveness and Improvement

Chairperson: Tobias Feldhoff, Johannes Gutenberg University of Mainz, Germany

Chairperson: Jerich Faddar, University of Antwerp, Belgium

Discussant: Charalambos Charalambous, University of Cyprus, Cyprus

Since early 2020, school systems around the globe had to deal with the sudden outbreak of the Covid-19 pandemic. In all countries, schooling was disrupted. School systems at all levels (policies, administration, school and teaching) were faced with many challenges and had to find solutions in the shortest time possible to organise schooling and teaching in such a way that learning at a distance is possible. On the one hand, school improvement activities, through which such solutions are designed and implemented, become the centre of attention. On the other hand, the question arises what impact these solutions will have on student learning outcomes. The symposium presents examples from different countries: What kind of challenges do schools face, and what can be learned from addressing them during the Covid-19 pandemic in the field of school improvement and educational effectiveness at different levels of the school system. The first contribution from the Netherlands analyses the steering relations between primary school leaders and members of their board of directors during the Covid-19 pandemic and the influence of this coupling on teacher learning as part of school improvement. The second paper takes a closer look at different challenges that schools face in Germany, Austria, and Switzerland. It discusses relevant context-factors within and outside schools related to these challenges. The third paper, from the French-speaking part of Belgium, analyses student learning outcomes in terms of motivation and well-being of students of secondary schools during school closures and the effect of teacher actions on student outcomes.

Steering relations and school improvement. Covid-19-related changes in Dutch primary schools.

Presenting Author:Arnoud Oude Groote Beverborg, Radboud University Nijmegen, Netherlands; **Co-Author:**Marlies Honingh, Radboud Universiteit Nijmegen, Netherlands; **Co-Author:**Femke Geijsel, Radboud University Nijmegen, Netherlands; **Co-Author:**Floor Basten, Open Universiteit Nederland, Netherlands

Steering relations between primary school leaders and members of their board of directors, as well as how, and under which conditions, such couplings between persons affect teachers' school improvement initiatives are poorly understood. The need for such developments became immediate through the Covid-19 pandemic, and this rare situation allowed investigating the change of (multilevel) relations for teachers' learning and developments in extraordinary circumstances. This study is part of a larger project, in which a multimethod longitudinal design was applied. Data was gathered from 20 directors and 60 school leaders before and during Covid-19 measures, and from 286 teachers during the Covid-19 measures. Teachers' learning and developments (team creativity scale), managerial coupling on content (focus on culture scale), and coupling on capacity within and between organizational levels (collective efficacy scale) were measured to assess changes in the nature of steering relations and how their impacts on teachers' learning and developments changed. Analyses are currently being conducted.

Challenges schools face during the COVID-19 crisis and how they change over time

Presenting Author:Tobias Feldhoff, Johannes Gutenberg University of Mainz, Germany; **Co-Author:**Nina Jude, University Heidelberg, Germany; **Co-Author:**Katharina Maag Merki, University of Zurich, Switzerland; **Co-Author:**Falk Radisch, Institute of school education and educational research, Germany; **Co-Author:**Stefan Brauckmann-Sajkiewicz, Alpen-Adria-University, Institute of instructional and school development, Austria; **Co-Author:**Kai Maaz, Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Katharina Kriegbaum, Heidelberg University, Germany

In early 2020, school systems around the globe had to face the sudden outbreak of the Covid-19 pandemic. In all countries, schooling was disrupted. Reactions of educational system varied broadly: Regulations on the policy and administration level met schools which had to deal with individual challenges and find solutions quickly. Many European countries reacted with school closures and remote learning settings. Still, disruptions are still ongoing and part of the current everyday school-life. The paper describes the challenges that schools in Germany, Austria, and Switzerland faced from March 2020 to March 2021 and the context factors of learning relating to these challenges. Analysis is based on data taken from the trinational study "S-Clever - School improvement faces new challenges". In the study, school principals from primary and secondary schools (K4-K12) in fourteen federal states in Germany, in Austria, and in five German-speaking Swiss cantons were surveyed via online questionnaire at two points in time within a year.

Students motivation and well-being during and after the lockdown: Lessons for the future

Presenting Author:Sébastien Dellisse, Université catholique de Louvain (UCL), Belgium; **Co-Author:**Noémie Baudoin, Université catholique de Louvain (UCL), Belgium; **Co-Author:**Dominique Lafontaine, Université de Liège, Belgium; **Co-Author:**Liesje Coertjens, Université catholique de Louvain (UCL), Belgium; **Co-Author:**Ariane Baye, University of Liège, Belgium; **Co-Author:**Françoise Crepin, Université de Liège, Belgium

When schools closed due to the covid-19 crisis in March 2020, secondary education students in the French-speaking part of Belgium received homework. In May 2020, some grades were allowed to return partially at school. This study sets out to, firstly, investigate the motivation and well-being of secondary education students during the lockdown of schools and right after their partial reopening, secondly, to document the practices put in place by teachers and, thirdly, to examine the effects of these practices on the students' motivation and well-being. More than 6,000 secondary education students filled out the online survey in June 2020. Results indicate that about 20% of students went back to school. Girls, students from a low socioeconomic background, from vocational tracks and students who had repeated a grade proportionally returned less to school. The well-being and motivation of students who did not return to school were quite similar to that of their peers who partially returned to school. The Covid-19 crisis did not appear to affect the average level of student motivation and well-being compared to previous studies. Students reported less stress due to schoolwork, and felt more boredom, but did not report higher levels of sadness or anxiousness. The results highlight the importance of teacher support and feedback as well: students who received a lot of homework but had limited contact with their teachers, felt less motivated.

Session D 13

23 August 2021 15:45 - 16:45

Session Room 18

Collaborative Workspace

Higher Education

University Teacher and Student Well-being: Interrelations, Impact of COVID-19, and Future Directions

Keywords: Educational Psychology, Goal Orientation, Higher Education, Motivation and Emotion

Interest group: SIG 04 - Higher Education

In response to the COVID-19 pandemic, European universities closed their doors—forcing teachers and students alike to engage in emergency online education. This is expected to exacerbate stressors and difficulties (e.g., little face-to-face contact, abruptly transitioning to a potentially unfamiliar learning format, etc.), which can be expected to affect well-being. Therefore, it seems crucial to investigate how teachers and students are functioning in light of the COVID-19-impacted educational context. This collaborative workspace, focused on well-being in academia, is based on the assumption that individuals are influenced by the system within which they exist. Accordingly, we will present and discuss prior and ongoing research centered not only around university teacher and student well-being, but also how they are intertwined and the role that personal, interrelational, and institutional factors may have therein. We will introduce three studies as a basis for the present workspace. First, an interview study was conducted prior to COVID-19, which investigated teachers' and students' well-being and how these were intertwined within universities in Germany and the Netherlands. The second study reports on a longitudinal interview study conducted prior to and throughout COVID-19 regarding university students' well-being in the Netherlands. The final quantitative longitudinal study focused on German and Dutch university teachers' motivations, coping, and well-being during a COVID-19-impacted semester. Based on this, our collaborative workspace will discuss opportunities for future (collaborative) research, including potential interventions designed to support these populations, and investigate possibilities of promoting teacher and student well-being within and outside of the context of COVID-19.

University Teacher and Student Well-being: Interrelations, Impact of COVID-19, and Future Directions

Presenting Author:Lisa Kiltz, University of Groningen, Netherlands; **Co-Author:**Marjon Fokkens-Bruinsma, University of Groningen, Netherlands; **Co-Author:**Ellen Jansen, University of Groningen, Netherlands; **Co-Author:**Martin Daumiller, University of Augsburg, Germany; **Co-Author:**Raven Rinjas, Augsburg University, Germany

In response to the COVID-19 pandemic, European universities closed their doors—forcing teachers and students alike to engage in emergency online education. This is expected to exacerbate stressors and difficulties (e.g., little face-to-face contact, abruptly transitioning to a potentially unfamiliar learning

format, etc.), which can be expected to affect well-being. Therefore, it seems crucial to investigate how teachers and students are functioning in light of the COVID-19-impacted educational context. This collaborative workspace, focused on well-being in academia, is based on the assumption that individuals are influenced by the system within which they exist. Accordingly, we will present and discuss prior and ongoing research centered not only around university teacher and student well-being, but also how they are intertwined and the role that personal, interrelational, and institutional factors may have therein. We will introduce three studies as a basis for the present workspace. First, an interview study was conducted prior to COVID-19, which investigated teachers' and students' well-being and how these were intertwined within universities in Germany and the Netherlands. The second study reports on a longitudinal interview study conducted prior to and throughout COVID-19 regarding university students' well-being in the Netherlands. The final quantitative longitudinal study focused on German and Dutch university teachers' motivations, coping, and well-being during a COVID-19-impacted semester. Based on this, our collaborative workspace will discuss opportunities for future (collaborative) research, including potential interventions designed to support these populations, and investigate possibilities of promoting teacher and student well-being within and outside of the context of COVID-19.

Session D 14

23 August 2021 15:45 - 16:45

Session Room 3

Roundtable

Instructional Design, Learning and Special Education

Experimental Studies

Keywords: Comprehension of Text and Graphics, Computer-assisted Learning, Experimental Studies, Instructional Design, Learning and Developmental Difficulties, Science Education, Student Learning, Writing/Literacy

Interest group: SIG 06 - Instructional Design, SIG 12 - Writing

Chairperson: Firtria Arifyanti, University of Szeged, Doctoral School of Education, Hungary

Dynamic Interactive Visualizations in Economics – An Experimental Study

Keywords: Comprehension of Text and Graphics, Computer-assisted Learning, Instructional Design, Student Learning

Presenting Author: Stefanie Findeisen, University of Konstanz, Germany; **Presenting Author:** Josef Guggemos, University of St.Gallen, Switzerland

Graphical visualizations are of central importance when it comes to learning new content. Visualizations enable a connection of verbal information with visual representations and thus facilitate information processing. In addition, visualizations can foster learners' interest in the content or make learning processes more interesting. At the same time, the activation of several channels (e.g. auditory and visual) can lead to a higher retention rate. However, when it comes to the visualization of dynamic processes, conventional (i.e. static) forms of visualization often reach their limits. Here, dynamic visualizations represent a promising means of visualization. We implement a learning environment for economic education in which students acquire basic knowledge of economics using interactive, dynamic visualizations. When working with these visualizations, students have the opportunity to change certain parameters (e.g. elasticity of supply and demand, tax rates, or fixed minimum prices). We analyze (1) whether the use of interactive, dynamic visualizations leads to higher learning effects than the use of static visualizations. Hereby, we control for the influence of non-cognitive facets (motivation, enjoyment of learning, etc.) as well as the perceived cognitive load. We use a learning software that was specifically designed and programmed for the purposes of our study and allows for an experimental design: use of dynamic visualizations (treatment condition) and use of static visualizations (control condition). The conference presentation will contain results of the experimental study (N = 200 students). Theoretical and practical implications will be discussed.

Effectiveness of psychomotor therapy for children with graphomotor impairments

Keywords: Experimental Studies, Learning and Developmental Difficulties, Science Education, Writing/Literacy

Presenting Author: Sibylle Hurschler Lichtsteiner, Languages and handwriting research group, University of Teacher Education, Lucerne, Switzerland; **Co-Author:** Werner Wicki, Languages and handwriting research group, University of Teacher Education Lucerne, Switzerland; **Co-Author:** Melanie Nideröst, University of Teacher Education of Lucerne, Switzerland; **Co-Author:** Christian Marquardt, Science&Motion GmbH, Germany; **Co-Author:** Carlo Di Brina, Department of Human Neuroscience, Sapienza University of Rome, Italy., Italy

The roundtable presents the first results of a controlled-randomised study on the effectiveness of psychomotor therapy among first and second grade children. The sample (N=87) consisted of children with graphomotor impairments, half of them met the criteria of DCD (developmental coordination disorder, Blank et al., 2019), the remaining children suffered from developmental dysgraphia (DD) without DCD diagnosis. The study examines how fine motor skills (measured by the BOT-2, among others) and handwriting skills (digitally measured on a graphics tablet) of the treatment group developed over the course of six months compared to the waiting control group. We present respective results as well as the digital assessments used and discuss future applications of the procedures for diagnostics, therapy and research.

Session D 15

23 August 2021 15:45 - 16:45

Session Room 15

Invited Symposium

Cognitive Science, Instructional Design

EFG: Effort Monitoring and Regulation (EMR): First findings from a novel framework

Keywords: Comprehension of Text and Graphics, Educational Psychology, Instructional Design, Metacognition, Problem Solving, Self-regulation

Interest group:

Chairperson: Anique de Bruin, Maastricht University, Netherlands

Organiser: Anique de Bruin, Maastricht University, Netherlands

Discussant: Shana Carpenter, Iowa State University, United States

A main goal of the EARLI Emerging Field Group 'Monitoring and Regulation of Effort' is to understand how learners use their experiences of effort to self-regulate learning through research that synthesizes central concepts and findings from cognitive load research and self-regulated learning research. The recently developed Effort Monitoring and Regulation (EMR) framework (De Bruin et al., 2020) puts specific emphasis on identifying 'diagnostic cues', i.e., predictive information that is used to come to effective monitoring judgments and regulation decisions. In this symposium, we share findings of our first, joint EMR pilot studies, all examining relations between subjective estimates of effort and learning, and objective measures of learning to improve the quality of self-regulated learning. First, the study by Scheiter et al. investigates how subjective measures of effort, task difficulty and confidence relate to objective measures of task performance and response time to identify reliable measures of these crucial concepts. Second, the studies by Janssen et al. and Onan et al. examined how students rate effort and judge learning when using more and less effective learning strategies (i.e., interleaved practice and blocked practice), how these ratings affect learning strategy choices, and how feedback influences both. The study by Janssen focused on the effect of performance feedback, while the study by Onan et al. explored fluctuation of subjective experiences over time. Finally, the study by Endres et al. looked into the effect of specific cue types on monitoring accuracy. Learners either focused on comprehension-based cues or performance-based cues before and after problem-solving.

How are appraisals of effort, confidence, and task difficulty related to objective task performance?

Presenting Author: Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:** Rakefet Ackerman, Technion - Israel Institute of Technology,

Israel; **Co-Author:**Vincent Hoogerheide, Utrecht University, Netherlands; **Co-Author:**EFG3 MRE, Maastricht University, Netherlands

The Emerging Field Group (EFG) "Monitoring and Regulation of Effort" aims to bring together two fields of research: cognitive load theory (CLT) and self-regulated learning (SRL). However, before these fields can be integrated, it is important to have reliable measures of the central constructs to both approaches and to examine how the key constructs are related to one another. In the present study, we investigated how subjective ratings of mental effort, task difficulty, and confidence were related to objective task performance and to objective response time. In an online study, 230 participants were asked to solve 30 puzzle problems. After solving each problem participants provided one of four ratings on a 0-100 scale. This study revealed that confidence clearly differed from the other ratings. The most pronounced differences were found among the hardest items in the task set. Within these items, confidence was more sensitive to success rate than the other ratings, while confidence was less tightly associated with response time than effort and difficulty ratings. We delineate future directions for further cross fertilization between the CLT and SRL research.

Students' Effort Monitoring during Interleaved and Blocked Practice

Presenting Author:Tamara Van Gog, Utrecht University, Netherlands; **Co-Author:**Eva Janssen, Utrecht University, Netherlands; **Co-Author:**Laura van de Groep, Utrecht University, Netherlands; **Co-Author:**Anne de Lange, Utrecht University, Netherlands; **Co-Author:**Erdem Onan, Maastricht University, Netherlands; **Co-Author:**Wisnu Wiradhang, Bina Nusantara University, Indonesia; **Co-Author:**Anique de Bruin, Maastricht University, Netherlands; **Co-Author:**EFG3 MRE, Maastricht University, Netherlands

In higher education, most students use suboptimal learning strategies because more beneficial strategies are typically more effortful to maintain. Based on the Effort-Monitoring-and-Regulation-framework, we hypothesize that most students may not see the benefits of effective strategies because they consider high effort as an indication that they are not learning well, and fail to consider that – under some conditions – high effort results in better learning outcomes. However, not much is known about how students' monitoring of their effort relates to their monitoring of learning. We aimed to gain insight into this by having students engage in two learning strategies, one of which requires comparatively less effort but results in poorer learning (blocked practice) and one requiring more effort yet resulting in better learning (interleaved practice). Participants (N=150 students) engaged in a study session in which they learned to identify painters by their paintings with interleaved and blocked strategies. For each strategy, they self-reported Perceived Effort, Perceived Learning, Perceived Effectiveness, and their Willingness to Use the learning strategy again. As expected, Perceived Effort and actual learning outcomes were higher for the interleaved strategy. However, participants perceived they learned more from the blocked strategy and also reported higher Perceived Effectiveness and Willingness to Use the blocked strategy again. Path model analyses confirmed that, especially for the interleaved strategy, Perceived Effort was an important negative predictor of students' Perceived Effectiveness and their Willingness to Use the strategy again. Together, our results suggest that students indeed use effort as a cue for monitoring learning.

Embracing the pain: The role of effort in choosing (in)effective learning strategies

Presenting Author:Erdem Onan, Maastricht University, Netherlands; **Co-Author:**Wisnu Wiradhang, Bina Nusantara University, Indonesia; **Co-Author:**Felicitas Biwer, Maastricht University, Netherlands; **Co-Author:**Eva Janssen, Utrecht University, Netherlands; **Co-Author:**Anique de Bruin, Maastricht University, Netherlands; **Co-Author:**EFG3 MRE, Maastricht University, Netherlands

In higher education, many students use learning strategies that are not effective for long-term learning (e.g., highlighting). Previous research showed that students used ineffective learning strategies since they perceived these strategies as more effective. However, the role of effort in this equation remains unclear. To address this issue, we investigated how students' perceived effort relates to their perceived learning and learning strategy choices in a painting classification task. Furthermore, we investigated the efficacy of an intervention to improve strategy choices, in which we required students to interpret these subjective learning experiences fed back through visual prompts. 150 undergraduate students learned the painting styles of artists by using in/effective learning strategies (blocked and interleaved practice, respectively). After each strategy use, they reported their perceived effort and perceived learning. Participants then chose one of these learning strategies to study new materials. The results revealed that perceived effort was negatively associated with perceived learning, and interleaved practice cost students higher effort than blocked practice. Although interleaved practice resulted in higher classification accuracy, students' perceptions reflected the opposite. The likelihood to choose the effective learning strategy increased when perceived learning for interleaved practice increased, but this likelihood decreased when perceived learning for blocked practice increased. Throughout the study, the number of students who chose interleaved practice increased from 13% to 40%, but our intervention did not contribute to the likelihood of choosing interleaved practice. These findings suggest students may engage in effortful learning strategies if they recognize the gains in their learning.

How can we optimize monitoring during complex learning?

Presenting Author:Julian Roelle, Ruhr University Bochum, Germany; **Co-Author:**Tino Endres, University of Freiburg, Germany; **Co-Author:**Julia Waldeyer, Ruhr-University Bochum, Germany; **Co-Author:**Martine Baars, Erasmus University Rotterdam, Netherlands; **Co-Author:**Alexander Renkl, University of Freiburg, Germany; **Co-Author:**EFG3 MRE, Maastricht University, Netherlands

In self-regulated learning, students typically overestimate their current learning status. This is especially true when the learning contents are complex and comprehension is required. In this study, we analyzed whether a comprehension-based (vs. performance-based) cue increases learners' metacognitive accuracy, in particular, when this cue is presented early during learning. We conducted a 2x2 experiment ($n=135$ university students). The factors were (a) comprehension-based vs. performance-based cue and (b) early vs. late cue instruction: cue was presented before first problem solving attempts or after (late instruction). Against our expectations, we found only that a performance-oriented cue led to better absolute accuracy and that early instruction led to better accuracy in the case of complex procedural tasks. Our findings were not in line with a recent meta-analysis. In our context, the focus on performance (instead of comprehension) was a better basis for metacognitive judgments.

Session E 1

23 August 2021 17:30 - 18:30

Session Room 9

Espresso Symposium

Educational Policy and Systems

Digital Citizens in Evolving Ecosystems (Part 2): equity issues of learning lives in transition

Keywords: At-risk Students, Case Studies, Citizenship Education, Communities of Learners, E-Learning/Online Learning, Economics of Education, Emotion and Affect, Parental Involvement in Learning, Quantitative Methods, Secondary Data Analysis, Self-regulation, Social Aspects of Learning and Teaching, Social Interaction, Technology

Interest group:

Chairperson: Halla Holmarsdottir, Norway

Discussant: Nancy Law, University of Hong Kong, Hong Kong

Children and youth today are growing up in a world surrounded by evolving ecosystems that are heavily influenced by digital technology. This technology has changed the way children and youth live and learn. This has become even more apparent during the COVID-19 pandemic. Yet, questions arise about equity issues and the digital divide, including unequal access, affordability and skills (next-generation digital divides). While access is essential it is also meaningless without a focus on skills and the learning lives of these digital citizens. The result is that technological transformations may leave some children and youth behind and in turn contribute to an increased digital deprivation. This symposium (part 2) brings together studies the following studies: Paper 1 looks at how equity issues encountered by learners have become even more aggravated during COVID-19 induced school suspension; Paper 2 aims to understand how COVID-19 has reinforced issues around access divides resulting in large numbers of children in Europe who are digitally deprived; Paper 3 is an in-depth study of students' learning lives during COVID in different phases of schooling operations using multimodal methods of investigation. Paper 4 is a conceptual paper on digital social capital, providing an overarching theme to connect the papers in this two-part symposium, which serves both as a discussant paper and to propose

further directions for research from an ecosystem perspective on how to support the learning of the digital generation.

Students' learning experiences during COVID-19 and familial SES

Presenting Author:Cheng Yong Tan, The University of Hong Kong, Hong Kong; **Presenting Author:**Qianqian Pan, The University of Hong Kong, Hong Kong; **Co-Author:**Yuxiao Zhang, The University of Hong Kong, Hong Kong; **Co-Author:**Min Lan, The University of Hong Kong, Hong Kong; **Co-Author:**Patrick Lam, The University of Hong Kong, Hong Kong; **Co-Author:**Nancy Law, University of Hong Kong, Hong Kong

This study investigates (a) how the pattern of parental home and school involvement varies according to familial socioeconomic status (SES) and (b) how this involvement in turn influences students' online learning experiences and outcomes during the COVID-19 school suspension in Hong Kong. It examines survey data collected from 932 secondary school students and their parents during June-July 2020, when schools resumed briefly after their suspension since the end of January. Familial SES was measured by parental data on their educational attainment, experience of financial hardship due to COVID-19, whether parents had received financial subsidies, and the perceived adequacy of home digital resources for their children's online learning at home during school suspension. Comprehensive parental involvement (home and school) data pertaining to two time frames—before and during school suspension—were collected. Students' online learning experiences during the school suspension period were measured by their participation in different types of online lessons/activities and their self-reports on challenges experienced. Students' outcomes included their acquisition of digital skills and self-regulation during school suspension as well as their self-reported anxiety after school resumption. The analysis shows that students' learning experiences and outcomes, as well as the extent of parental involvement vary significantly with their familial SES, thereby underscoring the complexities in digital divide during the school suspension. It also highlights the need for comprehensive measures that include the provision of parental support to ensure the quality of students' learning experiences and outcomes, particularly when online learning becomes the only means of educational provision.

Digitally deprived children in Europe

Presenting Author:Sara Ayllón, Universitat de Girona, Spain; **Co-Author:**Samuel Lado, Universitat de Girona, Spain; **Co-Author:**Halla Holmarsdóttir, Oslo Metropolitan University, Norway

The outbreak of the COVID-19 pandemic has completely changed the need for internet connection and technological devices among the whole population, but especially so, among school-aged children. For a large share of schoolers, access to a connected computer nowadays makes the difference between being able to keep up with their educational development or staying out of it. This paper provides a detailed account of the digitally deprived children in Europe, according to the latest wave available of the European Union – Statistics on Income and Living Conditions (EU-SILC). We find that 5.3% of school-aged children in Europe are digitally deprived and that differences are large across Europe. Children that cohabit with low educated parents, in poverty or in severe material deprivation are those most affected. We argue that digital deprivation should be considered as part of the definition of material deprivation used by the European Commission to monitor the progress of European societies.

Student well-being during COVID: Navigating through different phases of school suspension

Presenting Author:Xiao Hu, The University of Hong Kong, Hong Kong; **Co-Author:**Runzhi Kong, The University of Hong Kong, Hong Kong; **Co-Author:**Nancy Law, University of Hong Kong, Hong Kong

The COVID-19 pandemic has led to school closure and home confinement globally. There is an urgent call for researchers to understand the impacts of the pandemic on students' well-being. Since January 2020, school students in Hong Kong have experienced an extended period of over 100 days of school closure, a short period of school reopening when the pandemic spread subsided, followed by a government directive for earlier than scheduled summer vacation due to the third spike in COVID-19 infections. This paper reports on a study that investigates how students' physical, mental, social, digital, and academic well-being may be affected during the aforementioned three phases in schooling arrangement, as well as the factors that may protect or aggravate students against various potential challenges to their well-being during the pandemic. Using a combination of convenient, purposeful and snowball sampling, 22 secondary school students, 20 parents, and 3 teachers participated in this three-phase study from April to July 2020. We extended the Day Reconstruction Method (DRM), which is an established method to facilitate participants' recall of the episodic event-sequence, by leveraging mobile apps and wearable devices to semi-automate the process. The DRM data is supplemented by in-depth interviews with students, parents, and teachers. Analysis results reveal a number of impacts brought by home-confinement, the positive benefits of school resumption, and the emotional value of social connections during the pandemic. These findings have implications for teaching and learning under the changing contexts imposed by societal events.

Digital Social Capital and Well-being of Digital Citizens

Presenting Author:Shihui Feng, University of Hong Kong, Hong Kong; **Presenting Author:**Nancy Law, University of Hong Kong, Hong Kong

The central tenet of social capital theory is that social connections are valuable assets. It is also known that one's social capital is very much related to his/her socioeconomic status. The access and use of the resources embedded in students' social relationships are critical to students' development. In comparison with adults in working environments, the social assets possessed by students primarily reside with their family members, peers and teachers. This constrains the development and maintenance of students' social capital to those of their parents. With digital technologies, and in particular the Internet and social media, students have the possibility of extending their social capital beyond their offline social circles. In theory, students can leverage this new form of social capital enabled by online environments (digital social capital) to develop their social resources proactively beyond the accumulative resources shared through their family and school networks. Some critical questions relevant to this new form of social capital need to be investigated: 1) How do we measure digital social capital? 2) What are the factors affecting the development of students' digital social capital, and do these factors change with age? 3) What is the effect of students' digital social capital on their academic and socio-emotional development as well as sociopolitical participation? By referencing papers in this symposium, we illustrate how this line of research can make a significant impact on the theoretical development of social capital in the educational context as well as policy making to address digital divide and educational equity issues.

Session E 2

23 August 2021 17:30 - 18:30

Session Room 2

Espresso Symposium

Higher Education, Teaching and Teacher Education

Teachers' and educators' well-being in relation to professional demands and development

Keywords: Educational Psychology, Higher Education, Primary Education, Qualitative Methods, Quantitative Methods, Self-efficacy, Teacher Professional Development, Teaching/Instruction

Interest group:

Chairperson: Liisa Postareff, HAMK University of Applied Sciences, Finland

Organiser: Liisa Postareff, HAMK University of Applied Sciences, Finland

Discussant: Michelle Helms-Lorenz, University of Groningen, Netherlands

Teachers and other educational professionals face constant pressure and uncertainty caused by, for example, conflicting job roles and increasing job demands. During the previous year the pressure and uncertainty has further increased due to the pandemic. Such changes in the education sector have challenged the psychological well-being of educational professionals. The symposium focuses on psychological well-being (including e.g. burnout, self-acceptance, self-efficacy beliefs, work engagement) of teachers and other educational professionals. In addition to well-being, the focus is on the professional demands and professional development, and the aim is to increase understanding of how they relate to the well-being of educational professionals. The symposium provides a broad view to the topic through focusing on different educational levels and professions: primary and secondary school teachers and principals, higher education teachers and educational professionals in middle management. The different methodological approaches adopted in the studies provide various viewpoints to the topic. The symposium highlights that teachers' and educational professionals' well-being can be enhanced for example through reflectivity, collaboration and collegial

support, autonomy and reasonable workload. Furthermore, the studies highlight that through exploring and developing professional development as well as career demands and choices, it is possible to enhance well-being. In the Espresso symposium, the aim is to promote discussion between presenters and participants having expertise from different educational levels and contexts, of what kind of resources and professional development are needed to enhance the well-being of educational professionals.

Teachers' epistemic theories and their relations to the job demands, work engagement, and burnout

Presenting Author: Heidi Lammassaari, University of Helsinki, Finland; **Co-Author:** Lauri Hietajärvi, University of Helsinki, Finland; **Co-Author:** Kirsti Lonka, University of Helsinki, Finland

Global challenges and disruptions make educators meet new demands for learning and schooling. New policy documents concerning education tend to reflect sophisticated epistemic theories on the nature of knowledge and learning, and it is assumed that teachers are ready to directly implement them in practice. We propose that some of these changes may feel overwhelming for teachers, due to a potential misfit between the current demands of teachers' work and their resources to meet them. The present study aimed at finding out how teachers' epistemic theories and their reported practices relate to the novel ideas of new curricula, and whether teachers' epistemic theories are related to their work engagement and symptoms of burnout. Participants ($n = 228$) were Finnish subject-matter teachers. For data analysis, we specified a CFA measurement model where teachers' epistemic theories were represented as 1) reflective-collaborative (RC) theory and 2) knowledge transmission (KT) theory (Lammassaari et al., 2021 in review). To examine the relations between epistemic theories, work engagement and burnout symptoms, we plotted partial correlation network figures. Results showed a fit between RC theory and valuing the ideas of the new curriculum. Valuing these ideas had a negative relation with cynicism and work engagement, but positive with inadequacy. A direct positive connection between RC theory and work engagement was found out. This study contributes to understanding how teachers' epistemic theories may provide resources to meet the demands of teachers' work during educational reforms.

'To teach or not to teach?' An exploration of the career choices of educational professionals

Presenting Author: Tine Mombaers, University of Antwerp, Belgium; **Co-Author:** Peter Van Petegem, University of Antwerp, Belgium; **Co-Author:** Kristin Vanlommel, University of Antwerp, Belgium

This study contributes to the field of educational careers by researching a variety of career decisions educational professionals make. Using qualitative research methods we revealed influential factors towards different career choices educational professionals make. Moreover, this study sheds light on what considerations ultimately precede these career decisions. The research questions were: 1) What factors influence the career choices of educational professionals? 2) What considerations do educational professionals make when making career decisions? Semi-structured interviews with 27 educational professionals were carried out to answer the first research question. Official and free education networks and primary and secondary education were represented. We interviewed ten teachers, nine educational professionals with a function in middle management and eight school principals.

Findings show that influential factors such as support (from colleagues and school management), autonomy, job satisfaction, workload, self-efficacy, general job motivation and commitment to students play an important role in several educational career choices. Many of these influential factors relate to aspects of well-being of educational professionals.

Teachers' work engagement and burnout profiles

Presenting Author: Anni Holmström, University of Turku, Finland; **Co-Author:** Marjaana Veermans, University of Turku, Finland; **Co-Author:** Heta Tuominen, University of Turku, Finland

The Finnish education system has a reputation for being one of the best in the world with the teaching profession seen as a highly respected occupation. However, work overload and stress among teachers is relatively common. In the current study, teacher well-being is defined as consisting of three indicators: work engagement, burnout, and a sense of efficacy at work. The study investigated what kinds of teacher engagement and burnout profiles can be identified and how these profiles differ in terms of self-efficacy and interprofessional collaboration. The current study included data from 355 comprehensive school teachers in nine municipalities in Southwest Finland. Data were collected in autumn 2019 by an online self-report questionnaire. A person-oriented approach and two-step cluster analysis were utilized for grouping teachers based on their work engagement and burnout. Four different teacher groups with distinct well-being profiles were identified: engaged (40 %), moderately engaged (22 %), engaged-exhausted (19 %), and burned-out (19 %). Regarding the sense of efficacy and interprofessional collaboration, all teachers scored relatively high but ANOVAs showed some meaningful profile differences. Men were overrepresented in the moderately engaged group, while women were overrepresented in the engaged-exhausted group. The identified teacher well-being profiles are consistent with earlier research but the current study also increases understanding of the connections between well-being and interprofessional collaboration. It seems crucial to further study various factors, such as interprofessional collaboration, that may promote teachers' engagement and prevent burnout at work.

Supporting well-being of academic staff through a University Teaching Qualification programme

Presenting Author: Inken Gast, Maastricht University, Netherlands; **Co-Author:** Madelief Neelen, University of Maastricht, Netherlands

Over the last decades, changes within the higher education sector have created increased pressure and uncertainty for academics, which has resulted in cognitive, behavioural, physical as well as psychological issues for them. Moreover, an increased difficulty for new academics in teaching roles is their lack of educational training and experience when they enter the classroom for the first time. Professional development programmes at universities aim to increase teachers' pedagogical knowledge, skills and attitudes, and can in turn also positively affect teachers' well-being. This study explores in depth how teacher professional development programmes are related to well-being of university teachers. Special attention is paid to the relationship between specific learning activities applied in the programme and various dimensions of well-being at work. Semi-structured interviews were conducted with 10 participants of a specific university teaching qualification (UTQ) programme in the Netherlands. The results show that different learning activities are connected to particular dimensions of well-being. Whereas formal workshops are for example mainly related to environmental mastery, a purpose in life and personal growth, reflection seems to be especially connected to teachers' self-acceptance. Participating in a learning community on the other hand is mainly related to personal growth, teachers' sense of autonomy and helped to create positive relations with others.

Session E 3

23 August 2021 17:30 - 18:30

Session Room 14

Espresso Symposium

Teaching and Teacher Education

International perspectives on mathematics teaching: TALIS-Video findings from Europe and East Asia

Keywords: Comparative Studies, Mathematics, Survey Research, Teaching/Instruction, Video Analysis

Interest group: SIG 18 - Educational Effectiveness and Improvement

Chairperson: V Darleen Opfer, United States

Organiser: Eckhard Klieme, German Institute for International Educational Research (DIPF), Germany

Discussant: Courtney Bell, United States

About two decades ago, video-based studies provided seminal information on cross-cultural differences in mathematics teaching: TIMSS-Video (Stigler and Hiebert, 1999) and the Learner Perspectives Study (Clarke et al., 2006). Yet, none of them was designed to study the relationship between observed teaching and student outcomes. International surveys such as TIMSS and PISA reported on teaching connected to outcomes, but no observations were available, and again the data was cross-sectional. The TALIS-Video Study (Opfer et al., 2020) is the first multi-continental, comparative study using video- and artefact-based ratings of teaching combined with pre-post-questionnaires and tests. This was possible by focusing one topical unit, quadratic equations. The symposium will present secondary analyses of TALIS-Video data from England, Germany, Japan, and Shanghai (China). All papers will make use of the pre-post-design through multi-level prediction models, and compare across countries. First, the symposium explores the path dependency of classroom experience – namely,

how prior attainment drives teaching and learning within the focal unit (paper 1) and how perceptions of teaching quality reported in the pre-questionnaire predict outcomes (paper 2). Then, the symposium zooms into the use of much valued practices of mathematics teaching - real-world applications (paper 3) and whole class interactive teaching (paper 4) -, analyzing their prevalence, relationships with other practices and effects on outcomes. The unique design of TALIS-Video will allow for understanding cross-cultural variation in teaching practices and effectiveness, informing international debates on professional learning and educational policy. Opfer/Bell/Klieme/McCaffrey/Schweig/Stecher (2020). Understanding and Measuring Mathematics Teaching Practice. In <http://www.oecd.org/education/school/global-teaching-insights.htm>

CANCELLED

Presenting Author:Kenji Matsubara, National Institute for Educational Policy Research, Japan; **Co-Author:**Ayako Oura, National Institute for Educational Policy Research, Japan

This paper will not be presented at EARLI 2021. One of the important aspects of mathematical literacy is that mathematics is used to solve a problem set in a context (OECD, 2018). Accordingly, understanding and examining how mathematics lessons are contextualized has been of great interest among practitioners and researchers. TALIS Video Study (TVS) has developed and uses an observation code called real-world connections as one of the indicator codes to obtain information about quality of subject matter and teaching. The purpose of this study is to find out which teaching practices are related to the real-world connections by segment among the lessons of four TVS participating countries and regions: England, Germany, Japan, and Shanghai.

Q1. In which parts of the lessons is a high level of real-world connections typically used in the mathematics lessons of the four TVS participating countries and regions? Q2. Does teaching and learning of real-world connections have relationships with those of other teaching practices? First, descriptive statistics analysis is used to determine in which parts of the lessons a high level of real-world connection is observed. Then, we perform the Friedman test. To address the second research question, multi-way analysis of variance (ANOVA) is used to see the relationships between components and indicators by segment with real-world connection as an objective variable. When real-world connection and some high levels of other teaching practices, such as student cognitive engagement, co-occur, we can assume there is a higher likelihood that deep learning of mathematics occurs in that segment. The findings will be presented at the symposium.

The effects of students' prior attainment on their experiences of mathematics teaching

Presenting Author:Jenni Ingram, University of Oxford, United Kingdom; **Co-Author:**Ariel Lindorff, University of Oxford, United Kingdom; **Co-Author:**Tiarnach McDermott, University of Oxford, United Kingdom; **Co-Author:**Pamela Sammons, University of Oxford, United Kingdom; **Co-Author:**Peter Mitchell, University of Oxford, United Kingdom

This paper explores the impact of prior attainment on students' experiences of mathematics teaching and attainment in mathematics in four countries. The class that students are in can influence both what they are taught, and how they are taught. For example, in England, students are frequently grouped by prior attainment where groups with lower average attainment experience a narrower curriculum. Regression and multilevel analyses of the relationships between prior attainment, other student and class characteristics, students' opportunities to learn within the topic of quadratic equations, and the different experiences of mathematics teaching will be presented. Furthermore, the effect of these differences on students' attainment after teaching is also examined. The analysis focuses on data collected as part of the TALIS Video Study which includes videos of mathematics teaching, lesson materials, student measures of attainment, and teacher and student perceptions of mathematics teaching during the topic of quadratic equations. This analysis reveals differences in students' experiences and attainment that are associated with the class in which they are learning and raises questions around some students' access to the curriculum and particular mathematics teaching practices.

How valid are student-reported measures of teaching?

Presenting Author:Benjamin Herbert, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Jessica Fischer, German Institute for Adult Education - Leibniz Centre for Lifelong Learning, Germany; **Co-Author:**Eckhard Klieme, German Institute for International Educational Research (DIPF), Germany

International Large Scale Assessments (ILSAs) often assess teaching quality through student questionnaire scales and present country rankings on teaching quality based on mean scores from those scales as well as correlations with student achievement both within and between countries. Clearly, such uses are not valid, as scales mostly do not meet scalar invariance across countries, data are cross-sectional, there is no possibility to control for pre-knowledge, and in PISA students are sampled to represent schools, so the classroom level is actually missing. The present paper intends to provide validity arguments for two more modest use cases grounded in international student questionnaire data: (I) *Using international measures*, students as recipients of instruction can provide first-hand information about its quality *on the classroom level*, which is related to growth in achievement and motivation *within each country*; (II) Countries differ in the strength and structure of such relationships. The TALIS-Video Study adapted several measures from ILSAs like PISA and TALIS on generic aspects of teaching quality in mathematics in its student questionnaires. As the survey part of this study is based on full classrooms sampled, pre-post-design, and Post-instruments tailored to the content taught - features not implemented in any other international survey -, it can be used to test empirical evidences for four assumptions that we argue, are prerequisites for the uses described in the claims. As evidences the following aspects are examined across four countries: ICCs, multi-level correlations between pre and post assessments, measurement invariance and multi-level predictions of student outcomes.

Whole class teaching practices and their impact on mathematics learning in England and Shanghai

Presenting Author:Jinjie Xu, International Teacher Education Center, UNESCO, Shanghai (China), China; **Co-Author:**Yan Zhu, College of Teacher Education, East China Normal University, Shanghai (China), China

The dichotomy "East versus West" has long been foregrounded by international mathematics education community (Leung, 2001). This study aims to explore distinctive features of mathematics teaching practice in England (UK) and Shanghai (China) and examine its impact on student math achievement by using TALIS Video Study international dataset (pre and post student questionnaire, teacher video rating) and through the lens of TVS observation code. In a first step, descriptive statistics, multivariate analysis of variance (MANOVA) and Parson Correlation are used to describe and identify the characteristics of teaching practices in the respective educational systems based on all six dimensions of instructional practices captured by TVS observation protocol and examine the strength of inter-correlation among dimensions. In second step, a two-level hierarchical linear model is used to examine the impact of teaching practices on student mathematics test score after controlling for student and teacher background. Among these six dimensions, teachers in England outperformed nearly in all aspects of instructional practices, except for quality of subject matter and class management. Six dimensions are better aligned with each other in England (UK). Student's family economic and educational background had significant impact on their math achievement in England (UK) but did not influence student's test score in Shanghai (China). Result also shows certain teaching practice only apply for and make effect on student math achievement either in England (UK) or Shanghai (China). Such country specific context of teaching needs to be further discussed.

Session E 4

23 August 2021 17:30 - 18:30

Session Room 12

Espresso Symposium

Learning and Social Interaction

The role of communications technology in creating and expanding dialogic space

Keywords: Citizenship Education, Collaborative Learning, Communities of Learners, Communities of Practice, Competencies, Computer-supported Collaborative Learning, Conversation/Discourse Analysis, E-Learning/Online Learning, Educational Technology, Primary Education, Social Interaction
Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Rupert Wegerif, University of Cambridge, United Kingdom

Discussant: Kristiina Kumpulainen, University of Helsinki, Finland

This symposium focuses on an important aspect of dialogic education with technology: using communications media to expand dialogic space (Wegerif, 2007). The first two papers illustrate different ways in which communications technology can be used to bring perspectives from outside of formal education into dialogues internal to formal education. In both, engagement with an external perspective motivates, focuses and integrates students' dialogues. In the first a WhatsApp community mediates work with tutors from industry and in the second case Internet and video-mediated voices from industry enter into and shape from within the collaborative learning of groups of students in the classroom. The third paper investigates if primary school students show more dialogic thinking and learning after engaging with multiple voices mediated by social media. The final paper explores how technology can expand dialogic space by enabling perspectives to be voiced which might otherwise be silenced. Coherent with the focus of the symposium an innovative method will be used to support interaction. A Talkwall (<https://talkwall.uio.no/>) session will be set up for the symposium. Each of the pre-recorded talks in this espresso symposium will exhort listeners to form questions and engage in dialogue using this Talkwall. The discussion on the Talkwall will then be woven into the discussion in the symposium by our highly experienced discussant. The results will be tweeted and blogged to expand the dialogic space asynchronously and to include those unable to be at the synchronous session.

Tutors as mediators for dialogical learning communities via WhatsApp

Presenting Author: Francesca Amenduni, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:** Vito Candido, University of Bari, Italy; **Co-Author:** Susanna Annese, University of Bari, Italy; **Co-Author:** Maria Beatrice Ligorio, University of Bari, Italy

This presentation focuses on a case of hybridization between a university course on e-learning and two companies active in this field. Two aspects are analysed: i) The use of WhatsApp as boundary crossing tool; ii) The involvement of two types of tutors - university tutors (former students purposely trained) and company tutors - whose role is considered crucial. For each company two chats were set; one with students and university tutors and the other one including also a company tutor. In total, 12 students were involved (average age 24; 5 female), with six university tutors (2 female), and two companies' tutors (1 female; 1 male). The corpus of data is composed of 1726 posts and 175 units of analysis, defined as an argument chain which starts from a new discussion topic or idea until a new topic is introduced. A category grid was defined to qualitatively analyse the data. The dimensions found define the features of the dialogical communication occurring in this context. Results suggest that the groups are highly collaborative, sensitive to the roles and concerned about organizational and collaborative processes. When comparing chats with and without the company tutors, we found a higher focus on the course itself and more awareness of the students' role in the former case. The presence of both companies and university tutors seems to "force" students to seek for convergence – within further private spaces they set up - and by resorting to collaborative strategies and referring to the course's features.

Simulated Virtual Internships: expanding classroom learning dialogues with voices from enterprise

Presenting Author: Alison Twiner, University of Cambridge, United Kingdom; **Co-Author:** Louis Major, University of Cambridge, United Kingdom; **Co-Author:** Ryan Irvan, University of Cambridge, United Kingdom; **Co-Author:** Rupert Wegerif, University of Cambridge, United Kingdom

This presentation reports on a design research project investigating if simulated virtual internships, including videos prepared by industry partners, can give students access to authentic experiences of workplace practices. The project incorporated a challenge-based learning pedagogy applied to the UK Computing, Design and Technology curriculum, with Year 7 and 8 students (aged 11-13). The 6-7 week projects called for small groups of students to design, model or build a local solution to a global challenge presented via videos from industry directors and engineers in two International Telecommunications companies. We evidence how the project supported development of students' technical and future skills, including dialogue, collaboration and creative problem solving. We used statistical analysis of student survey data, systematic coding of video-recorded classroom observations and qualitative discourse analysis. Quantitative findings indicate significant change in students' perceptions of their skills. Links between the language used in the industry videos and the dialogue of the students were found during classroom observations. We discuss the role of communication technologies in bringing in perspectives from outside of the classroom in a way which engaged the students and provided a focus for the dialogues within their groups. We highlight the project's impact on students' outlook toward personal development, career aspirations, options and readiness. The project has significance for broadening horizons of expectation, where opportunities may otherwise be perceived as limited, thus disrupting the cycle of existing digital, social and geographical divides.

Is children's social networking site usage linked to dialogic thinking?

Presenting Author: Athanasia Kotsiou, University of Cambridge, UK, United Kingdom; **Co-Author:** Rupert Wegerif, University of Cambridge, United Kingdom

The Internet has revolutionised our lives in many ways, and some argue that it has even shaped our thinking itself. Its unique affordances include the unprecedented opportunities for networking, collaboration and exposure to multiple views, which are particularly facilitated by social networking sites (SNS). This study sought to identify whether self-reported SNS use is associated with a dialogic thinking disposition among elementary school children. It reports on a large study with children aged 9-11 years old in England. SNS usage was measured through a child questionnaire, while dialogic thinking was measured through the Measure of Dialogical Open Mindedness tool. Independent sample t-tests indicated that SNS users had significantly higher dialogic thinking scores compared to non-users. These findings were complemented with semi-structured interviews with 13 heavy SNS users. Thematic analysis supported the hypothesis that engagement with SNS may lead to the privileging of dialogic and open-minded ways thinking. According to the participants, SNS use has boosted their confidence in initiating conversations and sharing their opinions, while helping them to have a deeper understanding of complex phenomena. It appeared that by facilitating connections and exposure to multiple views, SNS may support the development of critical thinking and citizenship skills. More research with a larger sample size and further metrics of SNS usage is needed to illustrate the specific ways in which SNS may contribute to more dialogic ways of thinking.

How microblogging affords conditions for the realisation of student voices about sensitive topics

Presenting Author: Jo Inge Johansen Frøytlog, University of South Eastern Norway, Norway; **Co-Author:** Ingvill Rasmussen, University of Oslo, Norway; **Co-Author:** Sten Ludvigsen, Oslo University, Norway

Empowering students to express their own voices is an important educational aim, but sensitive topics in discussion-based activities pose particular challenges to the realisation of student voices. We analysed how one teacher and his lower secondary students coped with such challenges using microblogging technology tailored specifically for educational purposes. We examined the extent to which this particular technology afforded extended conditions for the realisation of student voices as ideas about the body and sexuality were put forward, shared and justified. Our results showed how the use of microblogging influenced interactional work, including the principle of sequentially that underlines dialogic interaction, and how this influence, in turn, afforded specific conditions for voice realisation that affected lesson content and focus.

Session E 5

23 August 2021 17:30 - 18:30

Session Room 18

Invited Workshop

How to Do a Peer Review? A Workshop on Learning to Review for EARLI Conferences and Journals

Keywords: Communities of Practice, Lifelong Learning, Qualitative Methods, Quantitative Methods

Interest group:

Chairperson: Antti Rajala, University of Oulu, Finland

Chairperson: Crina Damsa, University of Oslo, Norway

Peer review is a crucial part of what makes scholarly contributions legitimate. Despite its central significance in research, researchers are often left on their own in learning to review. This is a problem for prospective authors, many of whom have experience of receiving unconstructive reviews for their conference and journal submissions. Sometimes peer reviews can also be biased against underrepresented cultural/scholarly traditions of writing and doing research. From the perspective of journals, it is a challenge to find good reviewers for the rising number of submissions. Ultimately, uninformed reviews can stifle innovation and

creative renewal of the field of research on learning and instruction.

The aim of this workshop is to provide a comprehensive orientation for doctoral students and everyone interested in serving as peer reviewers for EARLI conferences and journals. In the workshop, the participants will get to practice reviewing, and different aspects of the peer review process will be discussed. The workshop instructors include editors of EARLI journals and other experts who present critical framings on peer-reviewing and knowledge production. The workshop begins with an orientation to the topic where critical issues regarding doing peer-reviewing will be discussed. After that, the participants are divided into working groups led by the workshop instructors. The workshop ends with a panel discussion in which the workshop instructors discuss important themes raised in the working groups and respond to questions of the participants.

In preparation for the workshop, the participants are asked to view/read the prerecorded videos and other materials in the repository.

How to Do a Peer Review? A Workshop on Learning to Review for EARLI Conferences and Journals

Presenting Author:Roger Säljö, University of Gothenburg, Sweden; **Presenting Author:**Piet Van den Bossche, University of Antwerp, Belgium; **Presenting Author:**Sangeeta Bagga-Gupta, Jönköping University, Sweden; **Co-Author:**Lars-Erik Malmberg, University of Oxford, United Kingdom; **Co-Author:**Thomas Martens, Medical School Hamburg, Germany

Peer review is a crucial part of what makes scholarly contributions legitimate. Despite its central significance in research, researchers are often left on their own in learning to review. This is a problem for prospective authors, many of whom have experience of receiving unconstructive reviews for their conference and journal submissions. Sometimes peer reviews can also be biased against underrepresented cultural/scholarly traditions of writing and doing research. From the perspective of journals, it is a challenge to find good reviewers for the rising number of submissions. Ultimately, uninformed reviews can stifle innovation and creative renewal of the field of research on learning and instruction.

The aim of this workshop is to provide a comprehensive orientation for doctoral students and everyone interested in serving as peer reviewers for EARLI conferences and journals. In the workshop, the participants will get to practice reviewing, and different aspects of the peer review process will be discussed. The workshop instructors include editors of EARLI journals and other experts who present critical framings on peer-reviewing and knowledge production. The workshop begins with an orientation to the topic where critical issues regarding doing peer-reviewing will be discussed. After that, the participants are divided into working groups led by the workshop instructors. The workshop ends with a panel discussion in which the workshop instructors discuss important themes raised in the working groups and respond to questions of the participants.

In preparation for the workshop, the participants are asked to view/read the prerecorded videos and other materials in the repository.

Session E 6

23 August 2021 17:30 - 18:30

Session Room 13

Roundtable

Learning and Social Interaction, Lifelong Learning

Learning and Professional Development

Keywords: Case Studies, Competencies, Informal Learning, Lifelong Learning, Problem Solving, Social Development, Vocational Education, Workplace Learning

Interest group: SIG 14 - Learning and Professional Development

Chairperson: Christian Harteis, University of Paderborn, Germany

Workplace affordances facilitating students' workplace learning: A qualitative exploration

Keywords: Case Studies, Lifelong Learning, Vocational Education, Workplace Learning

Presenting Author:Lieke Ceelen, Open University of the Netherlands, Netherlands; **Co-Author:**Anne Khaled, HU University of Applied Sciences, Netherlands; **Co-Author:**Loek Nieuwenhuis, HAN University of Applied Sciences, Netherlands; **Co-Author:**Elly de Bruijn, Hogeschool Utrecht / OU, Netherlands

To contribute to the awareness of supporting workplace learning, the aim of this empirical study is to operationalize how students are invited to learn at workplaces. More specifically, this study explores workplace affordances that facilitate student physiotherapists' and student nurses' learning. The term affordances is used to refer to all activities, direct and indirect interactions in which students are engaged while learning at workplaces (Billett, 2001). The qualitative research method enabled the researchers to identify affordances that are provided at workplaces to support students' learning. We specifically focus on affordances in students' work activities in interaction with their supervisors, and other colleagues. Seven students and their supervisors were observed during a twenty-week internship experience at workplaces in physiotherapy and nursing. First, the researchers familiarized themselves with the raw data by means of reading through multiple interview transcripts and observational field notes. A sub-set of data was selected to start exploring and describing the data (Brooks & King, 2014). Explanation of the data involved all authors and was an iterative process of multiple cycles of organizing, discussing, and interpreting data to allow a preliminary understanding of our results (Miles et al., 2019). In the round table session, we plan to discuss these preliminary results. Questions will structure the discussion during the session. Participants are invited to help to discuss emerging themes and relations in our work in progress.

The role of digital activities in the development of social competence and civic participation

Keywords: Competencies, Informal Learning, Social Development, Vocational Education

Presenting Author:Stefanie Findeisen, University of Konstanz, Germany; **Presenting Author:**Doreen Holtsch, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Nicole Bruderer, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Sabrina Müller, University of Zurich, Switzerland; **Co-Author:**Thomas Schlag, University of Zurich, Switzerland

As adolescents nowadays use digital technologies in both private and professional contexts almost permanently, it seems plausible that digital activities also play a major role in the development of social skills and civic participation. More concretely, we assume a combination of learning experiences in both contexts to be particularly beneficial in this regard. Research into the impact of adolescents' digital activities is a worthwhile endeavor because of its societal importance. Moreover, there is a need to address three main research gaps, especially with regard to vocational education and training (VET): (1) Existing research in VET is primarily concerned with professional skills whereas the development of social skills is less frequently addressed. (2) There are hardly any findings concerning interrelations between digital technologies, social competence, and civic participation. (3) Formal (i.e. VET) and informal (i.e. volunteer work) educational contexts are often investigated separately, although their interplay can be assumed to be relevant for adolescents' development. In order to draw comparisons regarding adolescents' acquisition of social skills and their civic participation in formal and non-formal educational contexts, our study focuses on adolescents from Switzerland and Germany who (a) either follow a VET program, (b) are involved in voluntary work (focus on volunteering in a church), or (c) are representatives of both groups. We combine (i) an online survey and (ii) in-depth interviews in order to analyze digital activities that adolescents perform on their smartphones in formal and non-formal contexts as well as the effects of those activities on trainees' civic participation and social competence.

Exploring the relationship between mental simulation and intuition in crisis response work

Keywords: Informal Learning, Lifelong Learning, Problem Solving, Workplace Learning

Presenting Author:Bianca Steffen, University of Paderborn, Germany; **Co-Author:**Michael Goller, Friedrich Schiller University Jena, Germany; **Co-Author:**Christian Harteis, University of Paderborn, Germany

Intuition is an important quality of expertise which is developed through professionals' learning through experience. It can be defined as the knowledge base needed to recognise situational cues that allow experts to access memorized information spontaneously (Simon, 1992). An important contribution to the development of intuition comes from mental simulation. However, the relation between mental simulation and intuitive decision-making is not yet fully explained (Harteis, 2017). Only few empirical studies concerning this particular relationship exist. Crisis response workers (CRW) offer counselling and mental support to

victims in emergency situations. So far, empirical research in the domain of crisis response is scarce. In conclusion, this contribution aims at (1) explaining how mental simulation contributes to the development of intuition and (2) presenting a model that distinguishes different modes of mental simulation according to the worker's stage of professional development.

Session E 7

23 August 2021 17:30 - 18:30

Session Room 17

Roundtable

Assessment and Evaluation

Assessment Methods and Tools

Keywords: Assessment Methods and Tools, Attitudes and Beliefs, Higher Education, Pre-service Teacher Education, Quantitative Methods, Science Education, Teacher Effectiveness, Teaching/Instruction

Interest group: SIG 01 - Assessment and Evaluation, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Prajakt Pande, Denmark

Rater Error in Standardized Observations of Teaching: Challenges from Latently Continuous Dimensions

Keywords: Assessment Methods and Tools, Quantitative Methods, Teacher Effectiveness, Teaching/Instruction

Presenting Author: MArk WHite, University of Oslo, Norway; **Co-Author:** Kirsti Klette, University of Oslo, Norway

Observation systems using standardized rubrics have become a key feature of research examining teaching quality. These rubrics measure instructional quality across a number of theoretically meaningful dimensions. One challenge with these observation systems is the high levels of rater error. Rater error undermines the benefits of using a standardized system, decreases the reliability with which teaching quality is measured, and introduces potential biases to scores. Thus, it is important to better understand rater error. One potentially important cause of rater error come from dimensions of teaching quality that are latently continuous, but divided into ordinal score categories by rubrics. For these dimensions, some cases will inevitably fall near the boundary of two ordinal score categories. These boundary cases are both difficult to score and a class of rater error that is of least concern. If such boundary cases are a major source of rater error, then rater error is of less overall concern than if other sources of rater error dominate. We present preliminary analyses that show that such boundary cases do seem to exist at fairly high frequencies, at least as perceived by raters. They, though, do not appear to be a dominant source of rater error. Rather, rater error seems to be driven by more fundamental differences in raters' interpretations of instruction and understandings of the observation rubric.

The validation of attitude toward science questionnaire among Indonesian undergraduate students

Keywords: Assessment Methods and Tools, Attitudes and Beliefs, Quantitative Methods, Science Education

Presenting Author: Azizul Ghofar Candra Wicaksono, University of Szeged, Doctoral School of Education, Hungary; **Co-Author:** Erzsébet Korom, University of Szeged, Hungary

The purpose of this study is to validate the attitude toward science questionnaire. 142 Indonesian students ($M_{Age}= 20.58$; $SD= 1.89$) from science and mathematics major in the undergraduate level were involved and administered with an online questionnaire. The instrument consists of 21 items divided into four different factors, including enjoyment (5 items), anxiety (6 items), participation in science learning and activities (6 items), and value of science (4 items). For data analysis, Cronbach-alpha reliability was used to check the consistency of the items, followed by Rasch analysis for examining individual item's fit and confirmatory factor analysis to check the validity of the model's structure. The result indicated that the overall items have good reliability. For the individual items fit, all items have good MNSQ value, but there are 3 items that have a low discrimination index. The model fit analysis with 4 factors has significant results and the other fit index (CFI, TLI, RMSEA, SRMR) shows good value. This result shows a high possibility that the attitude toward science questionnaire is suitable for the Indonesia sample and can be used for an assessment in the future study

Pre-service teachers' summative assessment literacy. Reflections on teacher education

Keywords: Assessment Methods and Tools, Higher Education, Pre-service Teacher Education, Teaching/Instruction

Presenting Author: Birgitta Fröjdendahl, Department of Language Education, Stockholm University, Sweden; **Co-Author:** Ali Yildirim, University of Gothenburg, Sweden; **Co-Author:** Anne Dragemark Oscarson, University of Gothenburg, Sweden; **Co-Author:** Raili Hilden, University of Helsinki, Finland

The aim of this paper is threefold. First, it examines what the TE programmes at three universities offer pre-service language teachers with regard to instruction and training in summative assessment (SA). Secondly, it analyses pre-service language teachers' responses to questions about SA at these universities. Thirdly, it addresses issues in the interface between on-campus courses and teaching practice, such as the validity of courses that are offered and examined by universities but that are conducted primarily in schools with local supervisors. Conclusions were drawn from analyses of policy documents for the three universities. Furthermore, semi-structured interviews ($n=25$) with pre-service teachers and surveys ($n=90$) from the same cohorts have been collected. The results of the present study showed that the authorities involved provide general requirements about subject-specialized knowledge of assessment and grading for local deliberation. This approach can both create opportunities and challenges for academics. On the one hand, they are entrusted with the task of teaching students knowledge and understanding as well as the skills needed for implementing assessment. On the other hand, such an unrestricted mandate can involve threats to validity in that deliberations on the micro-, meso- and macro levels may vary. Pre-service teachers in our project faced similar challenges and where neither offered the same amount of instruction on campus for various language subjects, nor during practicum.

Session E 8

23 August 2021 17:30 - 18:30

Session Room 7

Espresso Paper

Assessment and Evaluation, Cognitive Science, Learning and Special Education, Teaching and Teacher Education

Experimental Studies in Mathematics and Numeracy

Keywords: Assessment Methods and Tools, Cognitive Development, Cognitive Skills, Early Childhood Education, Experimental Studies, Higher Education, Instructional Design, Learning and Developmental Difficulties, Learning Approaches, Mathematics, Multimedia Learning, Numeracy, Quantitative Methods, Science Education, Special Education, Teacher Professional Development, Teaching/Instruction

Interest group: SIG 01 - Assessment and Evaluation, SIG 05 - Learning and Development in Early Childhood, SIG 11 - Teaching and Teacher Education, SIG 15 - Special Educational Needs, SIG 22 - Neuroscience and Education

Chairperson: Anneke Timmermans, University of Groningen, Netherlands

Making an effort versus experiencing load – the case of active and passive aspects of cognitive load

Keywords: Assessment Methods and Tools, Experimental Studies, Instructional Design, Multimedia Learning

Presenting Author: Tina Seufert, Ulm University, Germany; **Co-Author:** Melina Klepsch, Ulm University, Germany

In Cognitive Load Theory (CLT) the role of different types of cognitive load is still under debate. Intrinsic (ICL) and germane load (GCL) are assumed to be highly interlinked, but provide different perspectives. While ICL mirrors the externally given task affordances which learners experience passively, germane resources are invested by the learner actively. Extraneous affordances (ECL) are also experienced passively. The distinction of passively experienced load and

actively invested resources was inspired by the active and passive forms for effort in German language: "es war anstrengend" (it has been strenuous) versus "ich habe mich angestrengt" (I exerted myself). In a series of studies, we analyzed whether we can distinguish between these active and passive aspects of load by using these phrases and how this distinction relates to the three-partite concept of CLT. The initial study showed that a learning strategy training leads to a reduced passive load and an increase in actively invested effort. In two subsequent instructional design studies we included the active and passive item into a differentiated cognitive load questionnaire. We found the factor structure to be stable, with the passive item loading on the ICL factor and the active item loading on the GCL factor. There is also evidence for a potential link of passive load to ECL. We conclude that it is possible to distinguish between active and passive aspects of load, and that further research on this topic could be constructive, especially for learning tasks where learners act in a more self-regulated way.

The development of number word learning in bilingual children: Evidence from Singapore

Keywords: Cognitive Development, Early Childhood Education, Experimental Studies, Numeracy

Presenting Author:Pierina Cheung, National Institute of Education/Nanyang Technological University, Singapore, Singapore; **Co-Author:**Daphne Ang, National Institute of Education/Nanyang Technological University, Singapore, Singapore

The current study assessed number word learning in bilingual children between the ages of 3 and 5. We examine whether bilingual children progress through the same number word learning stages as monolingual children and whether number word knowledge transfers from a child's primary number language to their secondary language. We found evidence for the same number word learning trajectory in children's secondary number languages. We also found that meanings of individual number words do not necessarily transfer between languages. In sum, the current study suggests that bilingual children learn number words separately in each of their languages, and raises questions about how language may influence the acquisition of numerical knowledge for bilingual children in the classroom.

Numerical ordering skills and the ordinality of small numbers

Keywords: Cognitive Skills, Experimental Studies, Mathematics, Numeracy

Presenting Author:David Munez, National Institute of Education / Nanyang Technological University, Singapore; **Co-Author:**Josetxu Orrantia, University of Salamanca, Spain; **Co-Author:**Laura Matilla, Facultad de Educacion, Universidad de Salamanca, Spain; **Co-Author:**Rosario Sánchez, University of Salamanca, Spain

Albeit the ontogenesis of numeral ordinality is not clear yet, numeral ordering is becoming an influential line of research on children's and adults' numerical understanding. The ability to discriminate whether a string of Arabic numbers is in order has emerged as a robust predictor of arithmetic and math achievement in both children and adults. In the current study, we focus on the processes underlying decision-making in the numeral order judgment task with triplets. A drift-diffusion model for two-choice decisions was fit to data from ninety-six undergraduates. We formulated several models that reflected different theories on how numeral order may be stored in memory (and retrieved during numeral order judgments). Findings aligned with the hypothesis that small numbers provide more evidence of an ordered response and that numeral ordering abilities/skills reflect the operationalization of the numerical system—i.e., the probability that a number can cause an ascending sequence varies monotonically as a function of the position of a number on the counting sequence.

Perspective differences in the measurement of teaching quality – a matter of item reference?

Keywords: Assessment Methods and Tools, Experimental Studies, Higher Education, Teaching/Instruction

Presenting Author:Christine Johannes, University of Erfurt, Germany; **Presenting Author:**Tina-Myrica Daunicht, Friedrich-Alexander University of Erlangen-Nuremberg, Germany

Recent hypotheses explain a certain amount of heterogeneity between ratings of teaching quality with item reference (e.g. item wording addressing teacher or student behavior). A closer look at who is evaluated by whom might be a promising way to separate construct-specific differences from wording effects. However, investigations with systematic manipulation of item reference for students and observers have yet to be conducted. We therefore investigated effects of item references in 38 university courses ($N = 2737$ students) for the constructs didactic methods, goal clarity and learning participation. Students were randomly assigned to two wording conditions ("teacher" vs. "student"), whereas seven observers (three per course) each rated both wording versions in counterbalanced order. Additionally, teachers rated themselves. Results point at near to perfect correlations between wording conditions for both student and observer ratings (all $rs > .95$). For didactic methods, multilevel models showed lower student ratings for student reference (small effect), but identical prediction patterns both observer versions. Goal clarity ratings showed neither wording effects for students, nor any differential predictive patterns for teacher and observer data. In contrast, both observer ratings of learning participation had lower predictive power for student ratings with a teacher-focused wording. Supporting initial assumptions, our results suggest that wording might promote motivational and/or informational asymmetries in student ratings for constructs which focus on student behavior.

Disentangling Effect Sizes and Inferential Statistics in Science Communication

Keywords: Experimental Studies, Quantitative Methods, Science Education, Teacher Professional Development

Presenting Author:Kirstin Schmidt, University of Education Karlsruhe, Germany; **Co-Author:**Samuel Merk, University of Tübingen, Germany

Following the increased demand for evidence-based education, teachers are expected to incorporate scientific findings in their practical decision making. However, due to their limited educational research literacy, effective science communication is vital to provide scientific findings in an informative and easy-to-understand way and finally to support teachers in realizing evidence-based practice. Therefore, using a randomized design, we analyzed, on the one hand, whether in-service teachers perceive brief definitions of six different statistics (standard significance statement, p-value, Bayes factor, Cohen's U_3 , Cohen's d , standard significance statement with a literal description of the effect magnitude) as having different informational value. On the other hand, we investigated whether teachers correctly disentangle inferential statistics and descriptive effect sizes. Among others, the results suggest that teachers perceive the standard significance statement, Cohen's U_3 as well as the standard significance statement with a literal description of the effect magnitude as most informative and that they, on average, correctly interpret Cohen's U_3 as an effect size. However, teachers are not able to correctly disentangle inferential statistics and effect sizes consistently.

Manipulatives and symbolic tools in mathematics education for pupils with learning disabilities

Keywords: Learning and Developmental Difficulties, Learning Approaches, Numeracy, Special Education

Presenting Author:Steffen Siegmund-Johannsen, Institute of Special Education - Europa-Universität Flensburg, Germany

While in public perception mathematical competencies widely refer to logical-abstract or mental processes, it is the use of concrete manipulatives which can foster the learning of basic mathematical competencies in a different way. This is of particular relevance to the field of special education and the teaching of pupils with learning and intellectual disabilities. The aim of this theoretical paper is to understand the importance of symbolic action in the use of manipulatives, supported by mediation of language, particularly with regards to pupils with mathematical competencies at basal levels. First, this paper draws from findings of the psychology of learning and developmental psychology, revealing different types of manipulatives and emphasising the role of mediation of language in pupils' interactions with these concrete items. Reference is also made to recent studies that support these considerations. Then, the paper highlights the particular importance of these findings for teaching pupils with learning and intellectual disabilities, as the lack of mediation of language marks a central issue for this group of pupils. This will be demonstrated referencing empirical findings from the information processing theory and the neuroconstructivist approach. Based on these theoretical derivations, indications for the design and use of learning materials and instructions for mathematics education for pupils with learning and intellectual disabilities can be deduced. Finally, by drawing on examples from newly developed tasks, recommendations are made on how to appropriately incorporate manipulatives and respective dialogues into special needs teaching.

Session E 9

23 August 2021 17:30 - 18:30

Session Room 1

Educational Theory

Keywords: Argumentation, Case Studies, Citizenship Education, Early Childhood Education, Environmental Education, Motivation, Philosophy, Primary Education, Problem Solving, Qualitative Methods, Reasoning, Science Education, Secondary Education, Student Learning, Technology

Interest group: SIG 25 - Educational Theory, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Nina Bonderup Dohn, University of Southern Denmark, Denmark

Why situativity and tangible things matter to learning computational thinking in school

Keywords: Philosophy, Problem Solving, Reasoning, Technology

Presenting Author: Nina Bonderup Dohn, University of Southern Denmark, Denmark; **Co-Author:** Stig Børset Hansen, University of Southern Denmark, Denmark

The aim of this theoretical paper is to contribute to educational research and practice with a more adequate conceptualization of Computational Thinking (CT) and to point out a corresponding direction for supporting its learning in school. We argue that standard conceptualizations of CT as abstract algorithmic problem-solving is highly questionable and that CT instead is a set of situated and embodied skills. Evidence for this view comes from research within situated learning and embodied cognition (Lave, 1988, Abrahamson & Bakker, 2016.). We propose a theoretical framing of the role of tangible things in learning CT, since they make up the counterpart to the embodiment of the learner. This theoretical framing builds on research on things within the 4E (embodied, embedded, enactive, and extended) cognition framework. To elucidate the role of bodily interaction with things in abstract reasoning, we draw on Menary's (2018) work on the concept of cognitive integration, in particular the dual route of sensorimotor abilities and pattern recognition. We illustrate the learning of CT with tangible things with examples from K-12 (robots and e-textiles). Abrahamson, D., & Bakker, A. (2016). Making sense of movement in embodied design for mathematics learning. *Cognitive Research: Principles and Implications*, 7(1), 33. Lave, J. (1988). *Cognition in Practice*. Cambridge University Press. Menary, R. (2018). Cognitive Integration: How Culture Transforms Us and Extends Our Cognitive Capabilities. In A. Newen, L. De Bruin, & S. Gallagher (Eds.), *The Oxford Handbook of 4e cognition* (pp. 187–215). Oxford University Press.

Designing for motivation in learning Computational Thinking within science education

Keywords: Motivation, Problem Solving, Science Education, Technology

Presenting Author: Niels Dohn, Aarhus University, Denmark; **Co-Author:** Margrethe H. Møller, University of Southern Denmark, Denmark; **Co-Author:** Nina Bonderup Dohn, University of Southern Denmark, Denmark

Computational thinking (CT) is of prime significance for all citizens in the 21st century (Wing, 2006). This raises the question of how to design for motivation for learning CT for *all* learners, irrespective of their intrinsic interest. CT is a problem-solving method, following a distinct procedure from decomposition of problems to automatization of solutions through design of algorithmic formulas. A motivational challenge is that students tend to find activities boring if rigid procedure-following is required (Bjerre & Dohn, 2018). This theoretical paper addresses motivation for learning CT within science education. We explicate design principles that integrate different lines of research on supporting motivation. Our outset is the approach of *guided tinkering* proposed by Bjerre and Dohn (2018) for teaching programming. This approach builds on self-determination theory (Ryan & Deci, 2000) in combination with constructionism (Resnick, 2014). We further introduce the approaches of *gamification* and *hands-on interaction with tangible objects* which extend the design principles of *guided tinkering* in ways compatible with research in science education. Bjerre, A., & Dohn, N. B. (2018). Guided tinkering as a design for learning programming. In N. B. Dohn (Ed.), *Designing for learning in a networked world* (pp. 177–196). Routledge. Resnick, M. (2014). Give P's a chance: Projects, peers, passion, play. Proceedings of Constructionism and Creativity Conference, Vienna, Austria. Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68–78. Wing, J. (2006). Computational thinking. *Communications of the ACM*, 49(3), 33–35.

Supporting Computational Thinking with Design Activities

Keywords: Problem Solving, Qualitative Methods, Science Education, Technology

Presenting Author: Daniel Spikol, University of Copenhagen, Denmark; **Co-Author:** Melissa Kaivo, Arduino Verkstad AB, Sweden; **Co-Author:** David Cuartielles, Arduino Verkstad AB, Sweden

The complexity of defining Computational Thinking and the different ways that it is implemented in research and practice creates diverse challenges. However, an approach to this diversity is to situate Computational Thinking as a Design activity. In this paper, we show two cases; a research project, and a large-scale educational initiative that illustrates our approach to push Computational Thinking activities into Design Thinking. This design approach represents how to shift the conversation away from the challenges of defining at Computational Thinking back to opportunities to engage learners to investigate real-world problems. Our central argument is that design the activity that engages students and teachers into problem-solving through computational tinkering can help define what and how to use Computational Thinking.

Productive tensions: Computational things in preschool and school practices

Keywords: Case Studies, Early Childhood Education, Primary Education, Qualitative Methods

Presenting Author: Ane Bjerre Odgaard, University of Southern Denmark, Denmark; **Co-Author:** Roland Hachmann, University Southern Denmark, Denmark

This study contributes to current research on how designs for learning computational thinking (CT) are practically implemented in education. By examining learning activities in Danish preschools and elementary schools, we investigate how computational things, such as microcontrollers and robots, are employed in activities of learning CT. Data consist of video observations and are analyzed with a focus on tool mediated and situated activities. In accordance with elaborations on CT as a problem-solving strategy, we focus on how participants use computational things for problem-solving activities that appear central to the observed designs for learning CT. We investigate situations where participants employ computational things in ways that partly differ from the sequential problem-solving procedures of the intended task. These situations challenge underlying notions of CT-pedagogies that define outcomes as algorithmic solutions to well-defined problems. However, the observed tensions between intended task and participant orientations are discussed as potentially valuable learning situations rather than mere obstacles for learning. These tensions allow participants to imbue problem-solving activities with own intentions while still dealing with central aspects of CT. Thus, CT does not unfold as a universal and context-independent skill set, but rather as one structuring resource interlacing with other resources in situated practices.

Options for handling complex problems of global change from the perspective of children

Keywords: Argumentation, Citizenship Education, Environmental Education, Problem Solving

Presenting Author: Sarah Gaubitz, Uni Siegen, Germany

Complex core problems of global change such as the current extinction of species and climate change are already of interest to children of primary school age, as evidenced by survey studies such as the Geolino-UNICEF Child Value Monitor. Moreover, educational policy documents such as the Agenda 2030 call for an examination of these complex problems within the framework of Education for Sustainable Development (ESD) for primary schools. This study aims to analyze and characterize German primary school children's ideas and argumentations about possible ways of dealing with core problems of global change. In order to answer this question, the dilemma interview was selected as survey instrument. A total of 12 girls and 12 boys aged between eight and eleven years were interviewed. The resulting data were evaluated using a specific form of qualitative content analysis (cf. Kuckartz 2018). The results of the study show that the interviewed children see an urgent need for action and perceive complex problems as controllable since they name a broad spectrum of options for dealing with them. The reconstructed options for action can be meaningfully assigned to the Sustainable Development Strategies. One can deduce consequences for adaptive (primary) education in the context of ESD from the results of this study.

The active and dynamic materiality in maker-centered learning

Keywords: Qualitative Methods, Secondary Education, Student Learning, Technology

Presenting Author:Varpu Mehto, University of Helsinki, Finland; **Co-Author:**Noora Bosch, University of Helsinki, Finland; **Co-Author:**Kaiju Kangas, University of Helsinki, Finland; **Co-Author:**Pirita Seitamaa-Hakkarainen, University of Helsinki, Finland

In maker-centered learning, abstract ideas are transformed into tangible artefacts. We focus on this *idea materialization process* with a sociomaterial perspective, through which non-human elements are considered to be active and dynamic actors that can transform situations. We analyzed 35 hours of video recordings and ethnographic observations from one lower secondary school maker project. The materialization process appeared as a balancing act between an idea, its realization, and the context. Our aim was to get a wider understanding of how maker pedagogy is enacted by multiple actors in practice, to develop pedagogies that could answer the challenges requiring a collaborative approach with the more-than-human world.

Session E 10

23 August 2021 17:30 - 18:30

Session Room 11

Espresso Paper

Teaching and Teacher Education

Pre-service Teacher Education

Keywords: Argumentation, Attitudes and Beliefs, Competencies, Computer-assisted Learning, Conceptual Change, Design-based Research, Higher Education, Instructional Design, Misconceptions, Pre-service Teacher Education, Reasoning, Reflection, Science Education, Teacher Professional Development, Video Analysis, Writing/Literacy

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Carmela Aprea, University of Mannheim, Germany

Hard to resist – difficult to predict? Person-related predictors of misconceptions in education

Keywords: Attitudes and Beliefs, Misconceptions, Pre-service Teacher Education, Science Education

Presenting Author:Jana Asberger, University of Erfurt, Germany; **Co-Author:**Eva Thomm, University of Erfurt, Germany; **Co-Author:**Johannes Bauer, University of Erfurt, Germany

Recent research uncovers the prevalence of educational misconceptions among laypeople likewise practitioners, and reports initial attempts to counter such maladaptive assumptions (Ferrero et al., 2019). To develop effective correction strategies, it is desirable to extend our knowledge about individual characteristics that may facilitate or mitigate misconceptions. Therefore, the present study explores whether, and if, to what extent study background, study progress, cognitive skills, epistemic orientations and education-related attitudes and goals may predict students' endorsement of typical educational misconceptions. $N = 315$ students of different study backgrounds (36 % teacher education, 44 % education-related, 20 % education-unrelated) participated in an online survey that covered a questionnaire measuring the endorsement of four typical misconceptions in education, followed by scales measuring predictor variables. Results from structural equation models indicate that preservice teachers have less misconceptions than students of other education-related and education-unrelated study programs regarding two of four school-related topics. Overall, we however found only few significant effects of the selected predictors. Moreover, the effects revealed to be inconsistent across the four topics. Yet, the result patterns underscore the importance to consider the topic-specificity of misconceptions and the nature of educational topics as potential socio-scientific issues.

Promoting reflection about Teaching and Learning with Metaphors – Insights of a DBR-Project

Keywords: Conceptual Change, Design-based Research, Pre-service Teacher Education, Reflection

Presenting Author:Franco Rau, University of Vechta, Germany

This paper presents findings of a design-based research project in the field of educational sciences in a teacher training programme in Germany (Rau 2020). It follows an integrative media education approach. One objective is to address the question of how writing about metaphors can enhance the ability to reflect on pedagogical beliefs and theory. Student teachers' beliefs about learning and teaching represent a relevant learning requirement for teacher education (Blömecke 2004). According to Blömecke (2004), these beliefs need to be addressed in a teacher training programme. Different studies have highlighted the potential of metaphors as a tool to articulate and reflect on these beliefs (Saban et al. 2007, Marsch 2009, Thomas und Beauchamp 2011). Comparatively few attempts have been made to explore how teacher education can use this potential for promoting reflective learning (Lynch and Fisher-Ari 2017). A design-based research approach was chosen to address this issue. Following Reinmann and Sesink (2014) method involves cycles of problematization of practice, a theory-based design, practical testing, analysis, and interpretation of the results. The findings suggest that creating metaphors offers various possibilities of articulating and reflecting on one's own beliefs about teaching and learning. From a research point of view, metaphorical patterns provide insights into how students can express their thoughts and beliefs. From a practical point of view, the articulation of individual and group metaphors by the students opens up opportunities to become aware of their beliefs.

Effects of different scaffolds in a video-based learning environment for pre-service teachers

Keywords: Competencies, Pre-service Teacher Education, Science Education, Teacher Professional Development

Presenting Author:Marie Irmer, LMU Munich, Faculty of Biology, Biology Education, Germany; **Co-Author:**Dagmar Frick, LMU Munich, Faculty of Biology, Biology Education, Germany; **Co-Author:**Birgit J. Neuhaus, LMU Munich, Germany; **Co-Author:**Christian Förtsch, LMU Munich, Germany; **Co-Author:**Maria Kramer, Ludwig-Maximilians-Universität Munich, Germany

Diagnosing is an important part of a teachers' professional competence. To foster diagnostic competences of pre-service biology teachers, the video-based learning environment DiKoBi was developed. The tasks in DiKoBi focus on different biology-specific dimensions of instructional quality. In such complex learning situations, scaffolds can be an effective intervention. In this pre-post-study, we investigated the effects of different scaffolds on the participants' diagnostic competences. Participants receiving scaffolds supporting their pedagogical-content knowledge (PCK), scored significantly higher in the post- than in the pre-test. Scaffolds supporting the process of diagnosing (DA scaffolds) did not lead to better results in the post-test. We so assume that the diagnostic competences of pre-service biology teachers can effectively be fostered by including PCK scaffolds in the learning environment and thus a minimum of PCK knowledge is necessary for successfully diagnosing in authentic classroom situations.

Comparison for fostering student teachers' knowledge about scaffolding

Keywords: Higher Education, Instructional Design, Pre-service Teacher Education, Science Education

Presenting Author:Sabrina Stiel-Dämmer, University of Koblenz-Landau, Germany; **Co-Author:**Anke Maria Weber, University of Koblenz-Landau, Germany; **Co-Author:**Miriam Leuchter, University of Koblenz - Landau, Germany

One of the most powerful learning mechanisms is the comparison of two or more entities that can result in structural alignment and schema abstraction.

Comparing situations and objects (so called standards) is supposed to help students identify common features and relations, thus constructing new knowledge. The contribution of comparison to teacher education has seldom been studied. Teacher education aims at fostering knowledge about scaffolding as a theory as well as a knowledge that is relevant for practice. To achieve this, the use of case-based vignettes might be beneficial. In our study, we examined the comparative use of text vignettes for fostering science teacher students' knowledge about scaffolding. We developed an intervention and developed test instruments that comprised comparative case-based vignettes in the form of text. A pre-post-follow-up study with $N = 94$ students in three groups (EG1: 2 standards, EG2: 1 standard, CG: no intervention) was conducted. The students had studied the theory of scaffolding beforehand in the previous semester. The two-standards group outperformed the other two groups in the posttest as well as in the transfer test. Moreover, already during the intervention, the students in the two-standards group were able to identify more scaffolding utterances than the students in the one-standards group. Thus, the use of comparisons seems to be

appropriate for complex tasks in teacher education.

Teachers as informed pragmatists: supporting teacher students' didactic reasoning by journal writing

Keywords: Argumentation, Pre-service Teacher Education, Reasoning, Writing/Literacy

Presenting Author:Christina Schuba, Albert-Ludwigs-University Freiburg, Germany; **Co-Author:**Matthias Nückles, University of Freiburg, Germany

Teaching has been conceptualized as complex and ill-structured problem-solving. Accordingly, teacher students should be enabled to successfully tackle teaching problems by weighting the pros and cons of different instructional options and by making informed didactic decisions. To achieve this goal, teacher students should engage in didactic reasoning to justify their didactic decisions by drawing on scientific principles and evidence. To this end, we developed a didactic reasoning model and created a video-based tutorial as well as a written modelling example to convey our model. In an experimental study with $N = 106$ future history teachers, we investigated the effectiveness of these support methods. As medium for teacher students' didactic reasoning, we used journal writing. Accordingly, participants wrote a learning journal entry after they had studied either (a) the videotaped tutorial on didactic reasoning, (b) the learning-journal example illustrating the didactic reasoning, (c) both support methods, or (d) none of them. Overall, the results showed that both support methods, as preparation for the journal writing, were highly effective in stimulating teacher students' didactic reasoning. More precisely, the tutorial and the learning-journal example effectively helped students to generate and justify their own didactic goals and strategies, the learning-journal example even more so than the tutorial. These results are suggestive of ways how future teachers can be supported in developing didactic reasoning skills that allow them to cope with the complex nature of teaching.

How expert feedback influences the development of pre-service teachers' professional vision

Keywords: Competencies, Computer-assisted Learning, Pre-service Teacher Education, Video Analysis

Presenting Author:Christopher Neil Prilop, Leuphana University Lueneburg / University of Hamburg, Germany; **Co-Author:**Kira Elena Weber, Leuphana University Lueneburg, Germany; **Co-Author:**Marc Kleinknecht, Leuphana University Lueneburg, Germany

Professional vision of classroom management is considered a situation-specific skill that enables teachers to identify crucial events in complex classroom situations, to interpret observed events by connecting them to theory, and to decide how to react appropriately. Various studies applied classroom videos to foster pre-service teachers' professional vision. They were able to show that video analyses of classroom practice lead to an increase of pre-service teachers' professional vision of classroom events. Expert feedback can enhance the impact of video analysis. However, feedback in teacher education is sparse due to time and location constraints. Video-based online environments can be applied to create more options for time and location independent feedback by experts. Consequently, this study investigated the effects of video-based blended-learning environments (enhanced by expert feedback) on pre-service teachers' professional vision of classroom management.Pre-service teachers analysed videos of other teachers concerning classroom management facets (monitoring/managing momentum/rules and routines) online. While the control group only analysed the videos, the intervention group additionally received expert feedback on their analyses. Results showed that pre-service teachers of the intervention group improved their professional vision, while members of the control group showed no significant increases. Participants of the intervention group outperformed the control group for professional vision of rules and routines.The study indicated that the analysis of videos needs to be accompanied by expert feedback to tap the full potential. Expert feedback can be perceived as the focal lens reducing the complex nature of classroom events to its relevant components for classroom management.

Session E 11

23 August 2021 17:30 - 18:30

Session Room 5

Espresso Paper

Higher Education, Learning and Social Interaction, Teaching and Teacher Education

Collaborative Learning

Keywords: Collaborative Learning, Communities of Practice, Computer-supported Collaborative Learning, Conversation/Discourse Analysis, Cooperative/Collaborative Learning, Metacognition, Mixed-method Research, Problem Solving, School Effectiveness, Science Education, Social Aspects of Learning and Teaching, Social Interaction, Teacher Professional Development, Video Analysis

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education, SIG 16 - Metacognition, SIG 18 - Educational Effectiveness and Improvement, SIG 27 - Online Measures of Learning Processes

Chairperson: Erkko Sointu, University of Eastern Finland, Finland

Sequential patterns of micro-level interactions in teacher professional learning communities

Keywords: Communities of Practice, Conversation/Discourse Analysis, Cooperative/Collaborative Learning, Teacher Professional Development

Presenting Author:Marieke Thurlings, Eindhoven University of Technology, Netherlands; **Co-Author:**Marloes Hendrickx, Eindhoven University of Technology, Netherlands; **Co-Author:**Perry den Brok, Wageningen University & Research, Netherlands

This study explores micro-level interactions in teacher professional learning communities. Eight PLCs participated. The PLCs were typified into the level of interdependency, and relations with teacher- and PLC-characteristics with the found three types of PLCs (i.e., Joint work; Aid & assistance; Mixed) were explored. Group size, attendance, and subject related to type of PLC. Micro-level interaction was analyzed in terms of participatory (who is talking) and conversational moves (function of what is being said) dimensions. Findings showed that the participatory dimension patterns differed among the PLC types; the conversational moves dimension patterns not. Applying a non-linear dynamic systems approach allowed to typify micro-level interaction into patterns and connecting these to higher-level conceptualizations of collaboration, also validating and nuancing Little's construct of interdependency in teacher collaboration. Practical implications show that for different goals different types of PLCs can be used. To illustrate the findings in a more original way, we will play short music fragments where the instruments and melody represent the turn-taking and conversational move patterns as well as the PLC types.

Disparity in teachers' collaboration and schools' capacity for change

Keywords: Collaborative Learning, Communities of Practice, Mixed-method Research, School Effectiveness

Presenting Author:Lisa Maria Schaefer, University of Zurich, Switzerland; **Co-Author:**Thorsten Bohl, University of Tübingen, Germany; **Co-Author:**Albrecht Wacker, University of Education Ludwigsburg, Germany

Empowering students to participate as active citizens in an ever-changing society requires schools to be open to change. From an organizational and an innovational-theoretical perspective, teachers' collaboration is a critical predictor for this capacity for change on the school-level. Schools with comprehensive collaborations and convenient conditions for effective, deep, and sustainable change could be described as professional learning communities (PLC). Research and theory on PLCs and organizations which performing high in school improvement are quite extensive. Here, we argue that there is a lack of research on schools *without* this capacity.Data for this study consists of 56 qualitative interviews with teachers and principals from nine secondary schools. The data was recorded during an innovation process and analyzed using a multi-step mixed-method design. Qualitative content analysis, typification, and quantification of the data were merged into a coherent reconstruction.As a result, three types of teachers' collaboration are identified (loose exchange, task sharing, professional learning communities). Moreover, these types are refined by including the type-specific teachers' beliefs. Meaning here, that specific conditions within multiple scopes are held responsible by teachers for promoting or constraining developmental processes. For example, some schools struggle due to their efforts in organizational self-regulation, and others due to a lack of shared visions or stable external conditions. We conclude that there are schools that successfully engage in change. But those who do not share this capacity are suffering adverse side-effects caused by this lack of convenient conditions and external pressure to innovate.

Effect of metacognitive interaction on individual and group performance in collaborative learning

Keywords: Collaborative Learning, Metacognition, Science Education, Video Analysis

Presenting Author:Eetu Haataja, University of Oulu, Finland; **Co-Author:**Muhterem Dindar, University of Oulu, Finland; **Co-Author:**Jonna Malmberg, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland

In collaborative learning metacognitive interaction among the group members plays an important role enabling co-regulation and socially shared regulation of learning. Still, very few studies have explored if metacognitive interaction in collaborative learning predicts learning performance. Current study investigates the role of students' participation into metacognitive interactions in relation to individual and group learning performance. In this study 30 groups of secondary school students (n=94) attended for a five-week physics course involving four 90 min lessons. Each lesson included a collaborative learning session where the students solved physics problems in groups of three to four students. The students' classroom interaction was video recorded with 360 degree cameras and students' learning performance was measured after each collaborative session with a quiz, and in the end of the course with individual and collaborative exam.

Metacognitive group interaction episodes and each student's participation in those were coded from the video data. Multilevel models were used to analyze the nested data. Results show that frequency of individual participation into metacognitive group interaction episodes during collaborative work is a significant predictor for individual quiz performance after each session and in the individual course exam. However, frequency of metacognitive interaction episodes during the course didn't predict groups' performance in collaborative exam. Results of this study strengthen the evidence of the importance of metacognitive interaction for successful collaborative learning.

The relation of physiological synchrony with success in collaborative exam

Keywords: Collaborative Learning, Cooperative/Collaborative Learning, Metacognition, Problem Solving

Presenting Author:Eetu Haataja, University of Oulu, Finland; **Co-Author:**Muhterem Dindar, University of Oulu, Finland; **Co-Author:**Jonna Malmberg, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland

In collaborative learning, groups which are aware of their challenges but unable to change their strategies are less likely to adapt and collaborate successfully. Different methods have been explored to capture this phenomenon unobtrusively. Physiological synchrony (PS) between the students has been prominent in revealing dynamics in collaborating groups. PS seems to be higher especially when the students together are aware that they are having a challenge in their collaborative learning. However, it has remained unclear how PS relates to groups' performance in collaborative learning. This study investigates how PS during lessons of a physics course relate to groups' performance in a collaborative exam in the end of the course. In this study 94 students attended for a physics course consisting of 4 lessons. Each lesson included a collaborative learning task where the students worked in groups of 3-4 students. Students' electrodermal activity was recorded and multidimensional recurrence quantification analysis was used to derive PS between the students. Results suggest that PS during the lessons is negatively related to the end of the course collaborative exam performance. However, PS during the collaborative exam is not linked to performance on it. Groups showing high PS during collaborative learning might be aware of their challenges, but show lower collaborative learning outcomes, possibly indicating lack of adaptive use of different strategies to solve these challenges.

Academic Virtual Mobility Design: Synchronous interaction and collaboration in international teams

Keywords: Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Social Aspects of Learning and Teaching, Social Interaction

Presenting Author:Kateryna Holubinka, FernUni Hagen, Germany, Germany; **Presenting Author:**Christian M. Stracke, Open University of the Netherlands, Netherlands; **Co-Author:**Panu Forsman, University of Jyväskylä, Finland; **Co-Author:**Francis Brouns, Open Universiteit, Netherlands

Internationalization and digitalization trends have fueled the development of virtual mobility offers that are geographically distributed and appealing for the flexibility and "interactional asynchronicity" of the courses. At the same time there is a growing need for connectedness, as well as the demand for synchronicity inherent in international collaboration formats that set competence building, intercultural and international teamwork and transferring a global perspective as key aims. The present paper discusses the possibilities and pitfalls of integrating interactional synchronicity into the design of international virtual mobility courses reflecting on the development and findings of an ongoing three-year collaboration project between three European Universities.

Session E 12

23 August 2021 17:30 - 18:30

Session Room 15

Invited Symposium

Learning and Social Interaction

EFG: Momentary situated engagement, learning and performance

Keywords: Assessment Methods and Tools, Inquiry Learning, Metacognition, Mixed-method Research, Motivation, Primary Education, Problem-based Learning, Science Education, Social Aspects of Learning and Teaching, Social Interaction, Student Learning

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Ricardo Böheim, University of Augsburg, Germany

Organiser: Jennifer Symonds, University College Dublin, Ireland

Organiser: Ricardo Böheim, University of Augsburg, Germany

Discussant: ANASTASIA / NATASSA KYRIAKOPOULOU, National & Kapodestrian University of Athens, Greece

Researchers of student learning have recently begun to explore how learning processes are enacted in 'real time', i.e., across seconds and minutes, and in situ, i.e., in the messy, complex environment of the classroom or lecture hall. This symposium presents three studies from the Integrated Model of Momentary Learning in Context (IMMoLIC) Emerging Field Group, that each focus on a different aspect of momentary and situated engagement, learning and performance. In line with the field group's aim to integrate perspectives on this interdisciplinary topic, the presenters and discussant come from different fields of research on motivation and emotion, self-regulation, and conceptual change. Each study triangulates different methods, including video observation, systematic observation, think-aloud, artefacts, interviews, and multiple informants, to capture the topic from multiple viewpoints. The results signal that student engagement in learning can be enhanced by emotional connection to the learning material, that different forms of student activity emerge in response to proximal environmental factors, and that these momentary processes are a strong predictor of task performance.

"Observing Things": Using ICANs to promote science belonging, interest, and learning

Presenting Author:K. Ann Renninger, Swarthmore College, United States; **Co-Author:**Lux Barton, Swarthmore College, United States; **Co-Author:**Kadiata Diallo, Swarthmore College, United States; **Co-Author:**Krista Smith-Hanke, Swarthmore College, United States; **Co-Author:**Feven Yared, Swarthmore College, United States

Experiments can be cool, and the science involved fascinating, but a lot of kids do not see it this way. We report on a quasi-experimental, mixed method study of the ICAN intervention in an out-of-school science workshop. Participants were urban, Black, 9-10 year-old youth ($n = 14$, 10 female). They were supported to make individual connections to daily content by responding to ICAN probes (e.g., I can tell you which liquid had a greater surface tension in the penny experiment [soapy water or pure water], and how I know that liquid had a stronger surface tension). Analyses indicated sustained and deepened feelings of belonging and interest in science, and work with the evidence-based ICAN probes beneficially impacted learning. This type of situated focusing of participants' attention to make self-related connections to, and reflections on science activity, suggests the importance of these practices for students' belonging, interest, and learning.

Metacognition under the microscope. Triangulating assessment of metacognition during problem-solving

Presenting Author:Charlotte Dignath, DIPF Leibniz Institute for Education Research Frankfurt, Germany

Valid assessment of strategy use is among the most important gaps in contemporary research. As metacognition is a complex construct, different types of assessment should be combined in order to measure it extensively and during situated learning. The goals of this study were to (a) describe learners' metacognitive activities in the process of working on a complex task, and to investigate (b) the relationship between offline and online measures of

metacognitive strategy use, (c) how learners' use of metacognitive strategies is associated with their metacognitive knowledge, and (d) which measure of metacognitive activities contributes most to explain task performance. We investigated the strategy use, motivation, and performance of twenty psychology students before, during, and after working on a complex problem solving task for one hour by multimodal instrumentation. The results from video-based observations indicate that in the beginning of task execution, participants used more monitoring than control strategies. Analyzing the process of metacognitive activities over the course of the six measurement points of thinking-aloud revealed that monitoring and cognitive strategy use remained constant over time, whereas planning activities decreased dramatically after the first twenty minutes. Participants mainly reported using cognitive learning strategies, planning and monitoring activities, but only seldom motivational activities. Monitoring strategies as observed in the videos correlated with participants' self-reported use of metacognitive strategies but not with metacognitive knowledge. Performance did not correlate with the self-reported use of metacognitive strategies and metacognitive knowledge, but substantially correlated with metacognitive activities assessed with video-observation and thinking-aloud.

How school and classroom context explain children's momentary behavioural engagement

Presenting Author:Jennifer Symonds, University College Dublin, Ireland; **Co-Author:**Aisling Davies, University College Dublin, Ireland; **Co-Author:**Seanneen Sloan, University College Dublin, Ireland; **Co-Author:**Dympna Devine, University College Dublin, Ireland; **Co-Author:**Gabriella Martinez Sainz, University College Dublin, Ireland; **Co-Author:**Tamsyn Blue, University College Dublin, Ireland

Children's behavioural engagement in classrooms is an important facilitator of their achievement and of other children's opportunities to learn. In the current study we aimed to (a) identify common forms of behavioural engagement emerging momentarily in classrooms, and (b) estimate children's likelihood of manifesting these different forms of behavioural engagement based on contextual variables versus individual characteristics. Data were collected as part of the Children's School Lives nationally representative longitudinal study of Irish primary schooling. The Observational and Research Classroom Learning Evaluation (ORACLE) Pupil Record systematic observation tool was used in 121 classrooms in 92 schools to identify 634 children's main activity in English, mathematics, science or Irish, during ten sequential 30-second intervals. Latent class analysis revealed four main patterns of momentary behavioural engagement emerging across the five minute period: working primarily alone ($n = 273, 43.1\%$) working primarily with the teacher ($n = 145, 23.0\%$), working with friends or alone ($n = 94, 14.9\%$), and being passively or actively distracted ($n = 119, 18.9\%$). The engagement patterns were most frequently predicted by school and classroom context factors rather than by individual differences, suggesting how context facilitates different forms of schoolwork engagement. Influential predictors included school gender mix, school patronage, classroom size, and seating arrangement. However, some teacher characteristics (gender and highest qualification) also predicted the engagement patterns. Finally, a mixture of school, classroom, teacher, and child factors predicted the pattern of being primarily distracted from work - demonstrating the complexity of keeping children on task.

Session F 1

23 August 2021 18:45 - 19:45

Session Room 4

Single Paper

Teaching and Teacher Education

Mixed-method Research

Keywords: Inquiry Learning, Mixed-method Research, Pre-service Teacher Education, Primary Education, Social Sciences, Student Learning, Teacher Professional Development

Interest group: SIG 11 - Teaching and Teacher Education, SIG 20 - Inquiry Learning

Chairperson: Marjaana Kangas, University of Lapland, Finland

Teaching Controversial Topics in Elementary and Primary Schools

Keywords: Mixed-method Research, Primary Education, Social Sciences, Teacher Professional Development

Presenting Author:Monika Gigerl, Pädagogische Hochschule Steiermark, Institut für Elementar- und Primärpädagogik, 8010 Graz, Österreich, Austria; **Co-Author:**Britta Breser, KIRCHLICHE PÄDAGOGISCHE HOCHSCHULE der Diözese Graz-Seckau, Austria

This paper-presentation deals with the teaching of controversial topics in General Studies in primary schools. It tackles the question whether the topic *family* is perceived as controversial and how these perceptions are dealt with in class, as controversial topics can be conducive to achieve proficiency with regard to competencies for democratic citizenship (Hess, 2009). To answer this question, this research project takes a mixed-methods approach, analyzing both quantitative survey data ($n = 905$) and the content of qualitative, rule-guided interviews ($n = 25$). The findings outline in which contexts the topic *family* is perceived as controversial in primary schools and how teachers can respond to those perceptions, in order to facilitate pupils' competencies for democratic citizenship.

Pupils' individual differences in science and technology education: learning outcomes and process

Keywords: Inquiry Learning, Mixed-method Research, Primary Education, Student Learning

Presenting Author:Tessa Slim, Hogeschool IPABO Amsterdam/Aalkmaar / Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Johanna van Schaik, Radboud University, Netherlands; **Co-Author:**Anna Hotze, Hogeschool IPABO Amsterdam/Aalkmaar, Netherlands; **Co-Author:**Maartje Raijmakers, University of Amsterdam, Netherlands

The primary aim of this study was to identify how pupils' individual differences are related to their learning outcomes and learning process in science and technology (S&T) education, using a mixed methods design. At the start of the study, we assessed the reading comprehension, math skills, science skills, executive functions, coherence of speech, science curiosity and attitude towards S&T of 73 fifth and sixth graders. The pupils then received a four-lesson inquiry- and design-based learning unit on the concept of sound. Learning outcomes were measured through a pre- and post-test regarding pupils' conceptual knowledge of sound, a practical assessment of design skills and a situational interest measure. A factor score regression model showed significant influence from prior conceptual knowledge and the latent factor "academic abilities" (math, reading and science skills) on post conceptual knowledge. The latent factor "affective" (curiosity and attitude towards S&T) and prior conceptual knowledge were predictive of situational interest. Learning process was measured through individual interviews and pupil worksheets within a subsample ($N = 23$). We used latent profile analysis to identify three profiles based on pupils' individual differences, from which the subsample for qualitative analyses was selected. Codes and themes that emerged from the qualitative analyses revealed differences between pupils from the three profiles. The results of this study show how different types of pupils succeed or struggle within S&T education. This knowledge is essential for teachers in order to differentiate their instruction and guidance and provide the most optimal learning conditions for each pupil.

Professional identity development of student teachers

Keywords: Mixed-method Research, Pre-service Teacher Education, Primary Education, Teacher Professional Development

Presenting Author:Christa Dekker, Katholieke Pabo Zwolle, Netherlands; **Presenting Author:**Marieke Pillen, Katholieke Pabo Zwolle, Netherlands; **Co-Author:**Ietje Pauw, Hogeschool KPZ, Netherlands

This longitudinal mixed method study focuses on the development of the professional identity of student teachers from a teacher training institute in the Netherlands. Student teachers who develop a good sense of their professional identity are able to justify their actions and are in general more confident (Day, 2018). Insights in the development of student teachers' professional identity is needed in order to improve the support they receive from teacher educators in developing their professional identity. Each year of their four-year teacher training program, student teachers were asked to complete a questionnaire about their professional image of the teacher. Student teachers develop a preliminary professional identity based on the images of teachers and their initial beliefs and concepts of what constitutes a good teacher (Flores & Day, 2006). Furthermore, four third-year and four fourth-year students were interviewed about experiences during their internship that influenced their professional identity. Results from the questionnaire show rather small changes in professional images of teachers between first- and second-year students, but results show clearly that the social pedagogical aspects of teaching determine a large part of their professional conceptions. Preliminary results from the questionnaire in the third and fourth year, in combination with the interview data, seem

to indicate that student teachers have developed a more profound image of who they want to be(come) as a teacher. An indicator of this sense of student teachers' professional identity seems to be the use of professional language and the quality of their reflection.

Session F 2

23 August 2021 18:45 - 19:45

Session Room 18

Single Paper

Instructional Design, Learning and Special Education

Mathematics and Problem Solving

Keywords: Achievement, Experimental Studies, Learning Disabilities, Mathematics, Mixed-method Research, Motivation, Pre-service Teacher Education, Problem Solving, Secondary Education, Special Education

Interest group: SIG 06 - Instructional Design, SIG 15 - Special Educational Needs

Chairperson: Eva Wennäs Brante, Malmö University, Sweden

Do students show higher interest and performance when solving self-generated math problems?

Keywords: Experimental Studies, Mathematics, Motivation, Problem Solving

Presenting Author: Janina Krawitz, University of Münster, Germany; **Co-Author:** Luisa-Marie Hartmann, University of Münster, Germany; **Co-Author:** Stanislaw Schukajlow, University of Münster, Germany

Problem posing is considered to be a powerful teaching approach for fostering students' interest and problem solving performance. By posing their own problems, learners are assumed to become actively involved in their learning processes, and because of this involvement, their interest increases. Problem posing can trigger cognitive processes (e.g. understanding and structuring given information) and thereby improve problem solving. In contrast to the theoretically assumed positive effects of problem posing, systematic research investigating these effects is largely missing. In the present study, problem posing included having students generate a mathematical problem that was based on a real-world situation. We conducted a randomized controlled trial with 196 ninth- and tenth-graders to address the question of whether students who posed and solved self-generated problems that were based on real-world situations reported greater interest and showed better problem solving performances than students who worked on problems that were given to them involving the same real-world situations. The results confirmed that problem posing improved students' interest in solving self-generated problems. However, contrary to our expectations, problem posing did not increase problem solving performance. On a theoretical level, our study indicates the importance of students' involvement in the process of problem solving for interest in mathematics. Our research calls for the inclusion of problem posing in instructions that are aimed at increasing students' interest in mathematics. Future research should focus on the conditions under which problem posing is beneficial for problem solving.

Effect of Including a Context Situation in a Math Problem Statement

Keywords: Achievement, Mathematics, Pre-service Teacher Education, Problem Solving

Presenting Author: Irene Ferrando, Dpto. de Didáctica de las Matemáticas - Universidad de Valencia, Spain; **Co-Author:** Carlos Segura, Universidad de Valencia, Spain

In this presentation, we analyse the solution plans of two sequences of mathematical problems involving numerical estimations. In the first sequence, the questions are asked directly and explicitly, while in the second, the question arises from a contextualized situation. The objective is to analyse the influence of the structure of the problem statement on student success. Thus, we analysed the output of $N = 224$ and $N = 87$ pre-services primary school teachers. The results show that changing the structure of the problem statement makes it more difficult to develop a solution plan only when the number to be estimated is not directly requested.

Social Inclusion in Secondary School

Keywords: Learning Disabilities, Mixed-method Research, Secondary Education, Special Education

Presenting Author: Reto Luder, Zurich University of Teacher Education, Switzerland; **Co-Author:** Andre Kunz, Zurich University of Teacher Education, Switzerland; **Co-Author:** Ariane Paccaud, Pädagogische Hochschule Zürich, Switzerland; **Co-Author:** Giuliana Pastore, Pädagogische Hochschule Zürich, Switzerland

At present, school systems are shifting towards inclusive support for children with special educational needs (SEN). In order to feel socially included, students should experience schools as reliable places of learning and support. Particularly adolescents with SEN at lower secondary school level are at risk of being socially excluded and of developing a lower academic self-concept. The research questions of the present study aim at the situation of children with SEN in the transition from primary to lower secondary school in Switzerland, focusing on their social inclusion. The study conducts a multi method, longitudinal design, analyzing data from pupils with SEN ($N=49$), their peers ($N=584$), as well as their parents and teachers. Quantitative data was collected using a questionnaire with standardized scales as well as sociometric data. The qualitative data was collected by semi-structured interviews. The results of a Multi-Level-Analysis revealed SEN, indegree and relationship quality as significant factors determining social inclusion on the individual level, combined with the social density of the peer relations within the class as the most important factor on group level. In the qualitative data from the interviews, parents mentioned several factors of positive and negative impact on their kids, focusing on teacher-student-relationship. At school level, qualitative data enlightens some aspects of school organization regarding the transition of children with SEN from primary education to lower secondary level education.

Session F 3

23 August 2021 18:45 - 19:45

Session Room 16

Single Paper

Learning and Social Interaction, Learning and Special Education

Peer Interaction in Special Education

Keywords: Attitudes and Beliefs, Conversation/Discourse Analysis, Design-based Research, Higher Education, Peer Interaction, Primary Education, Social Aspects of Learning and Teaching, Special Education

Interest group: SIG 15 - Special Educational Needs

Chairperson: Riikka Hirvonen, University of Eastern Finland, Finland

The active participation of young adults with intellectual disability in goal-setting discussions

Keywords: Conversation/Discourse Analysis, Higher Education, Peer Interaction, Special Education

Presenting Author: Ana Luisa Rubio Jimenez, University of Cambridge, United Kingdom

Goal setting has been extensively studied as a skill that could enhance the self-determination of young adults identified with disabilities. The interventions commonly rely on the interaction of young adults with their educators to set goals and make plans to achieve them. In most cases, the analysis focuses on whether the students achieved their goals at the level expected by their teachers, and on whether there were significant improvements in their self-determination scores, thus overlooking the actual student-educator interactions that take place in this process. This paper presents findings of a sociocultural discourse analysis of discussions that took place when a group of three Mexican young adults with intellectual disability (ID), a teacher and a facilitator set 'Challenge of the Month' goals and make plans to achieve them. The findings show that the students actively proposed courses of action to achieve their goals; that teachers' communicative approach shifted from dialogic to authoritative positions; and that the presence of other students in the goal-setting process opens

up support spaces among peers with great potential to improve this process.

Inclusive entanglement of friendship networks and academic peer assistance in primary school

Keywords: Design-based Research, Peer Interaction, Social Aspects of Learning and Teaching, Special Education

Presenting Author:Kati Sormunen, University of Helsinki, Finland; **Co-Author:**Tuire Palonen, University of Turku, Finland; **Co-Author:**Eveliina Niskala, University of Helsinki, Finland; **Co-Author:**Hanna Reinius, University of Helsinki, Finland; **Co-Author:**Netta Tiippana, University of Helsinki, Finland

The purpose of the present investigation was to study how the school's development work towards inclusive education manifests itself in students' social relationships. Grounding to earlier studies on social dimensions of inclusion, we examined students' friendship networks and academic peer assistance. In this preliminary analysis, we report on an ongoing research project, in which a primary school community developed team teaching in research-practice partnership. For examining the impact of the project, two data collection points were conducted for third graders in the school to see how the students with various learning skills were integrated together with their peers. This paper focuses on the first data-collection point, in early October 2020, where students' friendship networks and academic peer assistance were examined through a social-networking questionnaire. Altogether 53 students (13 students at risk) peer networks were examined by using social network analysis. The results indicate that the class structures from previous years so no exist anymore in students' social networks. Students at risk of exclusion had fewer social connections than their peers in social networks were lower than their peers.

Primary school students' contact experiences and their attitudes towards peers with disabilities

Keywords: Attitudes and Beliefs, Peer Interaction, Primary Education, Special Education

Presenting Author:Marwin Felix Loeper, Paderborn University, Germany; **Co-Author:**Susanne Schwab, University of Vienna, Austria; **Co-Author:**Frank Hellmich, Paderborn University, Germany

Social participation of all children in the classroom is a crucial condition for successful inclusion in primary schools. Especially students' attitudes towards peers with special educational needs (SEN) are essential for the unconditional participation of children with SEN in inclusive education (de Boer, Pijl, & Minnaert, 2012). Several studies indicate that primary school students generally hold neutral to moderately positive attitudes towards peers with SEN (e.g., Schwab, 2015). Nevertheless, some students also tend to be rather negative towards peers with SEN (de Boer et al., 2012). So far, broad explanations for primary school students' attitudes towards peers with SEN are still pending. In our study, we asked $N=589$ students without SEN and $N=71$ students with SEN from third and fourth grade primary school classes to provide information on their attitudes towards peers with SEN and their contact experiences with disabled peers by filling in a "paper-pencil"-questionnaire. In addition, we consulted the classroom teachers in terms of their students' prosocial behaviour and behavioural difficulties (e.g., emotional symptoms). The results of a multilevel regression analysis indicate that on the individual level students' attitudes towards peers with SEN can significantly be explained by their contact experiences with peers with SEN and their gender – whereas girls are more positive than boys. Neither personal SEN, behavioural difficulties, nor prosocial behaviour are related to students' attitudes towards peers with SEN. On the class level, only the mean level of emotional symptoms affects students' attitudes towards peers with SEN significantly.

Session F 4

23 August 2021 18:45 - 19:45

Session Room 1

Single Paper

Teaching and Teacher Education

Pre-service and In-service Teacher Education

Keywords: Artificial Intelligence, In-service Teacher Education, Informal Learning, Pre-service Teacher Education, Quantitative Methods, Teacher Professional Development, Technology, Workplace Learning

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Kristina Schick, Technical University of Munich, Germany

Patterns in professional relationships between trainee teachers and their mentors: An LPA approach

Keywords: In-service Teacher Education, Quantitative Methods, Teacher Professional Development, Workplace Learning

Presenting Author:Michael Goller, Friedrich Schiller University Jena, Germany; **Co-Author:**Tobias Kaerner, University of Konstanz, Germany; **Co-Author:**Elisabeth Maué, University of Konstanz, Germany; **Co-Author:**Caroline Bonnes, University of Konstanz, Germany

Professional relationships between trainee teachers and their mentors during preparatory service (the second phase of German teacher education) can be described by four different characteristics: transparency, fairness, trust, and ambivalence. Based on these characteristics we analysed a sample of 2,584 trainee as well as in-service teachers via latent profile analysis (LPA) to identify patterns within the professional relationship between trainees and their mentors. We found four profiles differing in relationship characteristics and predicting external criteria such as physical stress symptoms, emotional exhaustion, and well-being. In the presentation all findings will be critically discussed. In addition, implications for teacher education will be derived.

Artificial Intelligence in Teacher Education: A Systematic Review of Research

Keywords: Artificial Intelligence, In-service Teacher Education, Pre-service Teacher Education, Teacher Professional Development

Presenting Author:ISMAIL CELIK, University of Oulu, Finland, Finland; **Co-Author:**Muhterem Dindar, University of Oulu, Finland; **Co-Author:**Hanni Muukkonen, University of Oulu, Finland

Artificial Intelligence (AI) has become one of the emerging technologies for education. However, the full potential of artificial intelligence is not entirely utilized in the learning and teaching process. Although teachers have an important role to integrate AI into their teaching, researchers have recently begun realizing its potentials within teacher development. This study aimed to provide an overview of research on AI applications in teaching practice based on a systematic review. For this aim, we reviewed 32 empirical articles. Our analysis showed that AI offers several opportunities to teachers in the preparation (e.g., defining students' needs and familiarizing with them), implementation (e.g., immediate feedback and teacher intervention), and assessment (e.g., automated essay scoring) of their course. However, the reliability of the machine learning algorithms, privacy issues, and lack of infrastructure were found to be some challenges. Teachers have taken roles in the development of AI technology to express their views on its usability and effectiveness. Further, we have found that teachers participated in AI development through checking the accuracy of the assessment of automated essay scoring systems. Overall, the current study highlights the importance of involving teachers in AI technology development for effective AI-based teaching.

Teachers' Professional Digital Competence, Transformative Digital Agency and TeachMeets

Keywords: In-service Teacher Education, Informal Learning, Teacher Professional Development, Technology

Presenting Author:Stine Brynildsen, Østfold University College, Norway; **Co-Author:**Ilka Nagel, Østfold University College / University of Oslo, Norway; **Co-Author:**Irina Engeness, Østfold University College, Norway

Teachers' Professional Digital Competence, Transformative Digital Agency and TeachMeet

This study examines Norwegian teachers' experiences in fostering professional digital competence (PDC) by participating in TeachMeets (TMs) and provides insights into how TMs might nurture the development of teachers' transformative digital agency (TDA) (Brevik et al., 2019) to transform their teaching practices in contemporary, digitally infused classrooms. A TM is an informal, continuing professional development (CPD) event where teachers from different disciplines share their pedagogical ideas about teaching and learning using digital technology. The study employs qualitative methods, drawing on two sources of data, which were collected in two steps: (1) through a questionnaire administered to teachers who had participated in one or several TMs ($n=36$) and (2) by conducting five in-depth interviews. Thematic analysis of the data is performed by taking an inductive approach to identify emerging themes and then drawing on the Norwegian PDC framework (Kelentrić et al., 2017) as the analytical lens. The findings reveal that (1) the teachers consider participation in TMs useful for the development of their PDC in several areas in the Norwegian PDC framework and (2) participating in TMs might nurture teachers' TDA. These findings have

implications for facilitating teachers' CPD to enhance their PDC and TDA.

References:Brevik, L. M., Gudmundsdottir, G. B., Lund, A., & Strømme, T. A. (2019). Transformative agency in teacher education: Fostering professional digital competence. *Teaching and teacher education*, 86 102875. Kelentrić, M., Helland, K., & Arstorp, A. (2017). Professional digital competence framework for teachers. Retrieved from https://www.udir.no/globalassets/filer/in-english/pfdk_framework_en_low2.pdf

Session F 5

23 August 2021 18:45 - 19:45

Session Room 17

Single Paper

Attitudes and Beliefs in Teaching and Instruction

Keywords: At-risk Students, Attitudes and Beliefs, Design-based Research, Educational Psychology, Experimental Studies, Motivation and Emotion, Pre-service Teacher Education, Teaching/Instruction

Interest group:

Chairperson: Mikaël De Clercq, Belgium

Implementing and evaluating growth mindset pedagogy with Finnish elementary school teachers

Keywords: Attitudes and Beliefs, Design-based Research, Motivation and Emotion, Teaching/Instruction

Presenting Author:Inkeri Rissanen, Tampere University, Finland; **Co-Author:**Sonja Laine, University of Helsinki, Finland; **Co-Author:**Ita Puusepp, University of Helsinki, Finland; **Co-Author:**Elina Kuusisto, Tampere University, Finland; **Co-Author:**Kirsti Tirri, University of Helsinki, Finland

This paper describes a design-based study in which five teachers at a Finnish elementary school implemented and evaluated growth mindset pedagogy (GMP). The study is part of the "CoPErNicus – Changing Mindsets about Learning: Connecting Psychological, Educational and Neuroscientific Evidence" research project, the aim of which is to investigate the views of students, teachers and parents on learning. In the present study, the teachers were receiving GMP training and conducted student interventions in their classrooms. According to the results, the value of GMP lies in its impact on students' situational attributions, in normalizing challenges and difficulties in learning and supporting emotion regulation. Teachers' own mindsets influenced how they adopted and implemented GMP. We discuss the dangers of a superficial understanding of growth mindsets in education, and challenge the view that GMP aligns with neoliberalist educational ideals. Cultivation of GMP is equivalent to the cultivation of teachers' ethical professionalism.

Every student can succeed! How a brief intervention reduces teachers' domain-specific fixed mindsets

Keywords: Attitudes and Beliefs, Experimental Studies, Pre-service Teacher Education, Teaching/Instruction

Presenting Author:Anke Heyder, Technical University Dortmund, Germany; **Co-Author:**Ricarda Steinmayr, TU Dortmund, Germany; **Co-Author:**Andrei Cimpian, New York University, United States

Numerous studies have shown that students benefit from having a growth mindset -- that is, believing that their abilities are malleable. Comparatively few studies investigated the importance of teachers' mindsets of student ability. These studies suggest that teachers' mindsets are related to their behavior, which in turn is associated with their students' motivation and emotion. Here, we present first results on a brief intervention developed to reduce fixed mindsets in teachers.

Brief interventions are effective, because they are "stealthy" in that they do not simply deliver a persuasive message, but rather require participants to become active, conveying the impression of doing something good for somebody else instead of participating in an intervention. Therefore, we used a cover story on how the university could attract future students (in teacher education) and randomly assigned 214 preservice teachers to reflecting and writing personal statements either on the potential positive impact teachers can have on students' lives (intervention group) or on the benefits of living in the Ruhr area for students (control group). Directly after the treatment, as well as one week later, they reported their domain-specific mindset of students' ability in apparently unrelated studies. As expected, teachers reported less fixed mindsets in the intervention group than in the control group. This effect remained for at least one week. The study thus supplements previous research on brief interventions with a cost-effective intervention that explicitly addresses teachers. The results are discussed with regard to their limitations, open questions and potential applications in teacher education.

Teachers' Growth Mindsets and Their Differential Treatment of Low- and High-Ability Students

Keywords: At-risk Students, Attitudes and Beliefs, Educational Psychology, Teaching/Instruction

Presenting Author:Alexander Browman, College of the Holy Cross, United States; **Co-Author:**David Miele, Boston College, United States; **Co-Author:**Sidney May, Boston College, United States; **Co-Author:**Shenira Perez, Boston College, United States; **Co-Author:**Ruth Butler, Hebrew University of Jerusalem, Israel

Recent research suggests that the extent to which teachers believe that intelligence is changeable (i.e., have a strong growth mindset) might influence achievement gaps that exist between different groups of students. This research explores one potential mechanism by which this may occur: teachers' mindsets may influence which instructional practices they employ with students they perceive as low versus high in academic ability. Education school undergraduates (Study 1) and in-service elementary school teachers (Study 2) were asked to rate their likelihood of using various supportive versus restrictive instructional practices with fictional or real students who they perceived to be low versus high in academic ability. A third study asked in-service elementary school teachers to rate the effectiveness of these kinds of practices when working with low- versus high-ability students in general. The results showed that the more participants endorsed a growth mindset, the more likely they were to engage in supportive instructional practices and less likely they were to engage in restrictive instructional practices (and the less effective they thought these practices were); and, this was particularly true when it came to helping students who they perceived as being low in academic ability. Finally, future longitudinal analyses of teachers' students (Study 3) will examine whether this differential treatment exacerbates motivation and achievement gaps between high- and low-ability students. Our findings therefore highlight one mechanism by which teacher mindsets might influence student outcomes—by influencing the types of instructional practices teachers employ—and that low-ability students might be most affected.

Session F 6

23 August 2021 18:45 - 19:45

Session Room 13

Single Paper

Assessment and Evaluation, Teaching and Teacher Education

Quasi-experimental Research in Pre-service Teacher Education

Keywords: Cultural Diversity in School, Educational Psychology, Mathematics, Pre-service Teacher Education, Quasi-experimental Research, Self-efficacy, Technology

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Franziska Zellweger, Zurich University of Teacher Education , Switzerland

Preservice teachers' judgements - Do normative criteria and students' background matter?

Keywords: Cultural Diversity in School, Mathematics, Pre-service Teacher Education, Quasi-experimental Research

Presenting Author:Christin Laschke, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Bettina Roesken-Winter, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Sven Schueler, Humboldt-Universität zu Berlin, Germany

Teachers' judgments of students' achievements need to be precise, and unbiased. However, previous research points to inadequate judgments by teachers driven by stereotypes when faced with an unexpected situation. In order to reveal pre-service teachers' (PST) judgments, we examine to which explicit criteria

they refer when confronted with an unexpected student solution of a probability problem. Furthermore, we question whether implicit judging criteria matter, by combining a creative student solution with first-names indicating a high or low social status or immigrant background. In our quasi-experimental study, 112 primary PSTs in their fourth bachelor term of a German university participated. The results show that the PSTs mostly used content-specific criteria (78 %), referring to mathematical concepts and procedures, instead of providing rather generic rationales. Also, implicit criteria matter as judgments were biased by social background. In sum, the results emphasize the need to bring to mind these implicit criteria, and to strengthen students' use of explicit ones.

The influence of knowledge and available time on teachers' diagnostic judgments on tasks

Keywords: Educational Psychology, Mathematics, Pre-service Teacher Education, Quasi-experimental Research

Presenting Author: Andreas Rieu, PH Freiburg, Germany; **Co-Author:** Timo Leuders, University of Education Freiburg, Germany; **Co-Author:** Katharina Loibl, University of Education Freiburg, Germany

One of the numerous components of teachers' diagnostic competence is assessing the cognitive demands of tasks to inform the selection of tasks for adaptive teaching. A diagnostic judgment on a task amounts to anticipating student thinking with respect to the solution process, its affordances and obstacles. The formation of such diagnostic judgments on tasks can be understood as information processing. When assessing task difficulties, teachers must perceive, interpret, and integrate relevant features of the task by applying their topic-specific pedagogical content knowledge (PCK). However, these assumptions on the processes underlying diagnostic judgments on tasks have rarely been modelled explicitly and investigated systematically. To address this research gap, the present study experimentally examines the influence of (1) PCK and (2) sufficient available time on the accuracy of task judgments and investigates the postulated processes by varying systematically task features of word problems on fractions. Pre-service teachers (N=212) are asked to decide in pairwise task comparisons which task is more difficult. The experimental manipulation was realized by (1) teaching specific PCK to an experimental group, but not a control group and by (2) asking both groups to judge the tasks once under time pressure and once without time pressure. The results show that specific PCK is the basis for all cognitive judgment processes, whereas time pressure only affects the complex information-integrating process of integrating multiple task features.

A start-up environment as a field-based practicum for technology teacher education

Keywords: Pre-service Teacher Education, Quasi-experimental Research, Self-efficacy, Technology

Presenting Author: Robbert Smit, University of Teacher Education St.Gallen, Switzerland; **Co-Author:** Clemens Waibel, University of Teacher Education St.Gallen, Switzerland

Pre-service teachers report that they do not encounter much student-centred ICT learning situations in their practicum. In our study, secondary school pre-service teachers are employed as assistants in ongoing courses for school students learning technology with the help of smart textiles. The research question is whether teacher students assisting develop, over time, higher self-efficacy beliefs and TPCK than teacher students in a control group without such experience. We expect teacher students assisting to develop more positively over time than their colleagues non assisting. Due to COVID the courses could not be held as planned and first results are based on a limited sample of 22 teacher students. We applied a teacher questionnaire with 9 dimensions containing items relating to pre-service teachers' awareness of TCK, TPK and TPCK in computer science learning environments complemented with items relating to perceived self-efficacy and experience in practicum adapted from Liu (2016). In the case of TPK and TPCK there was a significant difference over time between the two groups. The analysis of variance resulted in a $p = .076$ and $p = .089$ respectively. However, this development over time was different than expected. While the values for the control group went up, those for the intervention went down. This might be something like a praxis shock well-known in other teaching areas for the assisting teacher students.

Session F 7

23 August 2021 18:45 - 19:45

Session Room 2

Single Paper

Learning and Instructional Technology

Quasi-experimental Research and Educational Technology

Keywords: Achievement, Citizenship Education, Educational Technology, Experimental Studies, Higher Education, Learning Analytics, Quasi-experimental Research, Teaching Approaches

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Maria Zimmermann, Germany

The News Evaluator: An evidence based tool to support digital civic literacy in a world of fake news

Keywords: Citizenship Education, Educational Technology, Experimental Studies, Quasi-experimental Research

Presenting Author: Thomas Nygren, Department of Education, Sweden; **Co-Author:** Mona Guath, Department of Education, Uppsala University, Sweden; **Co-Author:** Carl-Anton Werner Axelsson, Division of Visual Information and Interaction, Department of Information Technology, Uppsala University, Sweden

In the complicated world of misinformation there is a great need for scalable educational interventions supporting students and a general public. In our study we address this challenge by developing an online tutorial based on civic online reasoning that aims to teach people to critically assess online information consisting of both text, videos and images. Our findings from online interventions with ca 250 participants highlights how observational learning may support pupils' lateral reading and abilities to determine credibility of digital news. Our findings also highlight possibilities to overcome some challenges of transfer across misleading items of information, including texts and images.

Video-Based Instruction in Flipped and Non-Flipped Classrooms: When Is It Effective and for Whom?

Keywords: Achievement, Educational Technology, Quasi-experimental Research, Teaching Approaches

Presenting Author: Marlene Wagner, Johannes Kepler University Linz, Austria; **Co-Author:** Detlef Urhahne, University of Passau, Germany

Flipped classroom refers to an innovative instructional approach in which students study educational videos at home and do homework assignments in class. The present study aims to compare flipped classroom with other forms of video-based instruction. Thirty-eight EFL school classes with 848 ninth-grade students took part in a quasi-experimental pre-post-test intervention study over four weeks. Two independent variables were completely crossed resulting in four experimental conditions: video (at home vs. in class) and instructional method (student-centred vs. teacher-centred). Multilevel analysis reveals that all four experimental conditions were equally effective in promoting students' learning gains. Confident and independent students profited most from the learning conditions, while at-risk, average and excellent students achieved lower learning gains. The study constitutes a first step towards a comprehensive evaluation of flipped classroom by using a better-controlled research design and may contribute to a more objective discussion about the positive effects of flipped classroom.

Investigating students' perceived benefits of system- vs. teacher-based learning analytics feedback

Keywords: Educational Technology, Higher Education, Learning Analytics, Quasi-experimental Research

Presenting Author: Clara Schumacher, Humboldt Universität zu Berlin, Germany; **Co-Author:** Dirk Ifenthaler, University of Mannheim, Germany

Feedback is considered to be essential for supporting learning processes. As learning is increasingly facilitated through digital learning environments new methods such as learning analytics enable additional insights into learning processes. These data can be used as a source for offering feedback to learners using dashboards, messages, recommendations or prompts. However, research on benefits students perceive from feedback based on learning analytics is limited. Thus, this study investigates students' perceptions of system- vs. teacher-based learning analytics feedback either with or without recommendations using a quasi-experimental approach. Findings indicate that benefits associated with the different feedback representations were perceived significantly different. Feedback with recommendations was perceived more beneficial than system-based feedback without recommendations. Future research might investigate students' perceptions of and reactions to learning analytics feedback in authentic learning settings.

Session F 8

23 August 2021 18:45 - 19:45

Session Room 8

Single Paper

Cognitive Science, Higher Education, Learning and Instructional Technology

Pre-service Teacher Education

Keywords: Assessment Methods and Tools, Cognitive Skills, E-Learning/Online Learning, Higher Education, Mathematics, Multimedia Learning, Pre-service Teacher Education

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education

Chairperson: Liron Primor, Israel

Prospective primary teachers' flexible use of arithmetic concepts, procedures, and strategies

Keywords: Assessment Methods and Tools, Cognitive Skills, Mathematics, Pre-service Teacher Education

Presenting Author: Andreas Schulz, Zurich University of Teacher Education, Switzerland

Procedural fluency and strategic competence in arithmetic are based on a flexible and meaningful use of procedures, concepts, and strategies. The present study assessed which sub-domains or tasks of procedural fluency and strategic competence on grade 6 level are particularly challenging for prospective elementary school teachers ($N = 280$). All tasks were calibrated in a Rasch analysis. A complementary analysis of some written down solutions of the participants illustrated that the tasks of the online assessment instrument enabled the adaptation of heuristic strategies, and the flexible reasoning about a procedure or formula. Especially combinatorial problems, rational numbers and division problems turned out to be challenging for a large proportion of the 280 prospective teachers in their first semester. The findings of the present study will be aligned to a tailored instructional program that engages students in a variety of similar tasks including complex and non-algorithmic thinking by which they explore the flexible and adaptive nature of mathematical concepts, processes, or relationships.

The Quality of Explanation Videos and their Relationship to Preservice Teacher Competencies

Keywords: Assessment Methods and Tools, E-Learning/Online Learning, Multimedia Learning, Pre-service Teacher Education

Presenting Author: Malte Ring, University of Tübingen, Germany; **Co-Author:** Taiga Brahm, University of Tübingen, Germany

The ability to explain and illustrate concepts is one of the most relevant skills for teachers of all domains. The digital revolution and, currently, the COVID-19 crisis results in increased use and development of digital explanations for instructional purposes. Teachers do not only resort to using existing videos from the internet but also create short explanation videos as they can be specifically tailored to their teaching and consequently, to their students' learning goals.

Analogues to "normal" explanations, whether or not video explanations are effective for learning might depend on their quality. Reliable measures of the quality of video explanations, however, are still rare and mostly do not connect criteria based on instructional explanations as well as multimedia and technology-enhanced learning research. We, therefore, developed a measure for the quality of video explanations in economic education. For this, in a first step, 13 categories were theoretically derived in the areas content, learner orientation, representation, process structure and language. The category system is currently used to rate $N = 37$ videos, which were created by preservice teachers during a university seminar. In an explorative analysis, we also analyze the relationship between professional teacher competencies and the quality of their explanation videos. This study expands our understanding of how the quality of video explanations can be measured and how it is related to teacher competencies.

Mathematics teacher students' use of instructional videos

Keywords: Higher Education, Mathematics, Multimedia Learning, Pre-service Teacher Education

Presenting Author: Anna-Katharina Poschkamp, Leuphana University of Lüneburg, Germany; **Co-Author:** Michael Besser, Leuphana Universität Lüneburg, Germany; **Co-Author:** Timo Ehmke, Leuphana University of Lüneburg, Germany; **Co-Author:** Poldi Kuhl, Leuphana Universität Lüneburg, Germany

Students in mathematics-related subjects have higher drop-out rates than students in other subjects at German universities. One of the most common reasons for dropping-out relates to problems of performance and understanding. Especially from the school context, it is already known that students use instructional videos (short: videos) for independent learning of difficult content, e.g. when the lesson content was not understood. Since learning at university is extremely individualized, using videos to support mathematics teacher students' learning could be an adequate way to reduce drop-out. Therefore, this submission points out the results of a survey at a German university with $N=300$ teacher students. The results show significant differences between mathematics teacher students' usage of videos and not usage of videos for major subjects. The results have been discussed critically to support teacher students in their learning.

Session F 9

23 August 2021 18:45 - 19:45

Session Room 5

Single Paper

Higher Education, Teaching and Teacher Education

Experimental Studies in Pre-service Teacher Education

Keywords: Artificial Intelligence, Educational Attainment, Experimental Studies, Higher Education, Learning Technologies, Multimedia Learning, Pre-service Teacher Education, Teacher Professional Development

Interest group: SIG 04 - Higher Education, SIG 06 - Instructional Design, SIG 11 - Teaching and Teacher Education

Chairperson: Baruch Schwarz, Hebrew University of Jerusalem, Israel

Reflective Goal-Setting Improves Academic Achievement: A Large-Scale Field Experiment

Keywords: Educational Attainment, Experimental Studies, Higher Education, Pre-service Teacher Education

Presenting Author: Izaak Dekker, Erasmus University Rotterdam, Netherlands; **Co-Author:** Michaéla Schippers, Erasmus University Rotterdam, Netherlands; **Co-Author:** Erik Van Schooten, Kohnstamm Institute, University of Amsterdam, Netherlands

Students often have trouble adjusting to higher education and this affects their performance, retention, and well-being. Scholars have suggested applying reflective goal-setting interventions, and most have found positive effects on academic performance and retention. However, one study found no effect at all, stressing the need for understanding the underlying mechanisms, as they could explain when the intervention works and why. Thus, we assessed these mechanisms through a rigorous effect test, using an experimental design and repeated measures. We measured engagement, self-regulated learning, well-being, academic performance, and retention at three points in a large scale randomized controlled trial involving first-year teacher and business education students ($N = 1,134$). The treatment group earned significantly more course credits and had lower drop out rates. Contrary to previous findings, these effects were independent of gender or ethnicity. Self-regulated learning or engagement did not mediate the effects. This study confirmed reflective goal-setting's small and direct effect on academic performance, but no mediating or moderating effects. The observed differences in implementation fidelity could explain previous studies' differing effects.

Effects of automatic adaptive AI-based feedback on diagnostic skills of pre-service teachers

Keywords: Artificial Intelligence, Experimental Studies, Learning Technologies, Pre-service Teacher Education

Presenting Author: Michael Sailer, LMU Munich, Germany; **Co-Author:** Elisabeth Bauer, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:** Riikka Hofmann, University of Cambridge, United Kingdom; **Co-Author:** Jan Kiesewetter, University of Munich, Germany; **Co-Author:** Julia Glas, Ludwig-Maximilians

Universität (LMU), Germany; **Co-Author:**Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

Simulation-based learning has been applied in teacher education to foster complex skills, such as diagnostic skills. However, students need adaptive feedback on their current performance to actually develop complex skills. Simulations themselves might provide feedback to the learners, however, they often remain on the task-level providing knowledge-of-result feedback. Thus, we developed an automatic adaptive feedback algorithm, which is based on methods of natural language processing, to support pre-service teachers during working with simulations. In an experimental study, we investigated effects of automatic adaptive feedback compared to static feedback (i.e. expert solutions) on diagnostic accuracy and diagnostic justifications in a simulation-based learning environment for pre-service teachers that covers diagnosing learning difficulties of pupils. Results show an indirect effect of automatic adaptive feedback on the quality of diagnostic justifications in unsupported simulations (in a post-test), which is mediated by the quality of justifications in the learning process. Further, results show no significant effect of automatic adaptive feedback either on diagnostic accuracy in the learning process or on diagnostic accuracy in unsupported simulations (in a post-test). Automatic adaptive Feedback via natural language processing shows high potential to improve pre-service teachers' learning of complex skills in simulations. However, it specifically affects the justifications that teachers provide for their diagnoses. The accuracy of the diagnoses was not affected by automatic adaptive feedback. Accuracy may depend more strongly on prior knowledge about alternative explanations, which were not emphasized in the adaptive feedback.

Acquiring Professional Vision by Classroom Video: Effects of Segmenting and Self-Explanation Prompts

Keywords: Experimental Studies, Multimedia Learning, Pre-service Teacher Education, Teacher Professional Development

Presenting Author:Monika Martin, Albert-Ludwigs-Universität Freiburg, Germany; **Co-Author:**Meg Farrell, Technische Universität München, Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany; **Co-Author:**Werner Rieß, University of Education Freiburg, Germany; **Co-Author:**Alexander Renkl, University of Freiburg, Germany

Classroom videos are a widely used tool in teacher education. They provide valuable opportunities for pre-service teachers to apply their theoretical knowledge about teaching and learning in analyzing practice situations. However, watching video is not effective per se. For example, the transiency of video combined with the complexity of classroom situations often hinders novice teachers noticing details. Hence, videos should be embedded in an instructional context that provides some support for pre-service teachers to apply their pedagogical-and-psychological knowledge and their pedagogical content knowledge. Research on multimedia learning suggests remedies for difficulties that arise when learning from videos. In this study with 89 biology pre-service teachers, we investigated to what extent applying two multimedia design principles to classroom videos can foster pre-service teachers' professional vision (i.e., noticing and knowledge-based interpreting of relevant events): *Segmenting the videos* and *self-explanation prompts*. We assessed participants' professional vision skills both before and after our one-hour training phase on small-group tutoring strategies. Contrary to our hypothesis, participants who learned with segmented video examples improved less during the training than did participants who learned with non-segmented videos. However, the detrimental effect of segmenting was found only for participants with medium to high prior knowledge. We did not find a significant positive effect of focused self-explanation prompts in the training phase over open prompts. Our findings indicate that applying multimedia design principles to classroom videos may not be as straight-forward as it seems to be at first glance.

Session F 10

23 August 2021 18:45 - 19:45

Session Room 7

Single Paper

Learning and Instructional Technology, Teaching and Teacher Education

E-Learning and Online Learning

Keywords: Case Studies, Content Analysis, E-Learning/Online Learning, Educational Technology, Experimental Studies, Language (L1/Standard Language), Pre-service Teacher Education, Qualitative Methods, Second Language Acquisition, Secondary Education, Teaching Approaches, Vocational Education

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education, SIG 27 - Online Measures of Learning Processes

Chairperson: Maria Platsidou, Greece

Unexpected effect of individualized mastery assessment feedback in short online grammar courses

Keywords: E-Learning/Online Learning, Experimental Studies, Language (L1/Standard Language), Secondary Education

Presenting Author:Uwe Maier, University of Education Schwäbisch Gmünd, Germany

Although digital learning environments frequently use mastery assessments, e.g., to control learning progression in online courses, there is evidence for inefficient feedback usage and non-adaptive student learning behavior following a mastery assessment. Considering the feedback intervention theory, this paper hypothesizes that students would benefit from individualized mastery assessment feedback that refers to a students' learning progression and cues what to do next in the course (treatment). Students in the control condition only received static feedback, which informed them about mastery or not. The study's research context is a web-app that served as a host for short online grammar courses in German language secondary classrooms. The system randomly assigned each student who started working on a short course to either the experimental or the control group. The paper analyzes data from 854 students in 63 classrooms on a fine-grained test-retest-sequences level ($n = 4294$). The individualized feedback had low but significant effects on the proportion of students reading the feedback on grammar rules (Cramer's $V = .05$), on click-rates in the rules-and-examples module ($d = .11$), and the failed training ratio ($d = -.10$). However, both experimental conditions did not differ in item feedback and rules reading time. A mixed effects linear regression model revealed a significant negative interaction effect of individualized feedback with higher course levels on follow-up mastery assessment scores ($\beta = -.04$, $p < .01$, $d=.26$). The paper discusses the unexpected findings from the perspective of the feedback level model.

Challenges and opportunities experienced by Swiss VET teachers during the shift to remote teaching

Keywords: E-Learning/Online Learning, Qualitative Methods, Teaching Approaches, Vocational Education

Presenting Author:Francesca Amenduni, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:**Martina Rauseo, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:**Chiara Antonietti, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:**Alberto Cattaneo, Swiss Federal Institute for Vocational Education and Training, Switzerland

In most countries, teachers struggled with the forced adjustment to working and teaching online caused by the pandemic, although in some cases opportunities were also highlighted. Challenges and opportunities experienced by teachers in the forced transition to online teaching may provide information on school digitalization readiness level. For this reason, we investigated challenges and opportunities reported by a group of Swiss vocational education and training (VET) teachers ($N=439$; $M = 170$; $F = 219$) by comparing which aspects they considered more challenging or promising. 871 open-ended answers written by teachers were analyzed through qualitative content analysis. The results showed that students' *assessment, inclusion, institutional organization and use of technologies* were reported significantly more as challenges than as opportunities. On the other hand, challenges reported in other studies such as *relation with students, educational design, material preparation, and personal organization* were equally reported as challenges and opportunities. Moreover, teachers' *professional development and students' skills development* were considered only as opportunities whilst *technological infrastructure* only as a challenge.

Digitally supported teaching and learning during the first COVID-19 lockdown

Keywords: Case Studies, Content Analysis, E-Learning/Online Learning, Secondary Education

Presenting Author:Mandy Hommel, OTH Amberg-Weiden, Germany

Extemporaneous, extensive digital supported home-schooling was necessary with the beginning of the first COVID-19 lockdown. Teachers, learners, and parents faced challenges they have not been prepared for. This investigation reports perceptions of teachers, learners, and parents particularly focusing on

teaching and learning processes at this time. Utilizing an online survey general attitudes towards digitally supported learning, the perceived difficulties, and positive aspects, as well as attitudes towards technology, facilities, and related skills of the three stakeholder groups teachers, learners, and parents were gathered. The sample consists of 462 students, teachers, and parents of one grammar school in Saxony (Germany). The online questionnaire comprised 13 items regarding the learning processes, 17 items regarding technology (both Likert format), and two items with open answer format (perceived difficulties, and positive aspects). Answers in Likert format have been analysed using exploratory factor analyses leading to a three-factor-solution for learning processes: self-directed learning, task culture, and learning results. Regarding technology a four-factor-solution can be related to components of the technology acceptance model: behavioural intention, perceived ease of use, perceived usefulness, and expectancies. The open items were analysed by qualitative content analysis. Thereby, the results reveal potentials for improvements. Regarding difficulties, the highest frequencies show up concerning the design of digitally supported teaching, the clarity of tasks, self-directed learning, and the missing coordinated use of technology by teachers. The most-reported positive aspects belong to asynchronous learning settings, the use of different technologies, and, again, self-directed learning.

Understanding English teachers' non-volitional use of online teaching during the COVID-19 pandemic

Keywords: E-Learning/Online Learning, Educational Technology, Pre-service Teacher Education, Second Language Acquisition

Presenting Author:Fang Huang, Qingdao University, China; **Co-Author:**Timothy Teo, Murdoch University, Australia

In English education, online teaching has shown its effectiveness in providing authentic language learning materials, improving listening and speaking proficiencies and cultural awareness (Yeh, 2018; Zou, 2013). However, Chinese EFL teachers' reluctance to teach online is still visible (Liu, Lin, & Zhang, 2017). Scholars (e.g., Bai, Wang, & Chai, 2019) have applied the technology acceptance model to explain Chinese EFL teachers' sluggish technology integration and found that, among others, internal and external factors (e.g., pedagogical beliefs, facilitating conditions, attitudes, perceived usefulness) were significant. However, these studies were mostly conducted in situations where teachers had an autonomy in deciding the extent they would adopt technology in English teaching. Teachers' non-volitional online teaching adoption is rarely researched but deserves scholars' attention.

Session F 11

23 August 2021 18:45 - 19:45

Session Room 11

Single Paper

Higher Education, Learning and Social Interaction

Educational Psychology in Student Learning

Keywords: Achievement, Collaborative Learning, Educational Psychology, Higher Education, Secondary Education, Self-regulation, Student Learning

Interest group: SIG 04 - Higher Education, SIG 06 - Instructional Design, SIG 16 - Metacognition

Chairperson: Peter Hobel, Denmark

A qualitative study of the academic challenges and help-seeking processes of high and low achievers

Keywords: Educational Psychology, Secondary Education, Self-regulation, Student Learning

Presenting Author:Francesca Suter, University of Zurich, Switzerland; **Presenting Author:**Carmen Hirt, University of Applied Sciences and Arts Northwestern Switzerland (FHNW), Switzerland; **Co-Author:**Katharina Maag Merki, University of Zurich, Switzerland; **Co-Author:**Yves Karlen, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland

Learning is associated with many challenges (Schenke et al., 2015). To master these challenges, help-seeking can be an effective strategy (Nelson-Le Gall, 1985; Newman, 2000), as it is connected to learning and achievement (e.g., Karabenick & Newman, 2006). Past studies have found several areas of challenges in which help was sought within the task of writing an academically oriented project paper (Hirt, 2019; Huber et al., 2011). Help-seeking processes are situational and can only be fully understood if the challenges as initiating points are included in the analysis. However, there is a lack of research analyzing the concrete challenges (vs. areas) which initiate help-seeking processes (e.g., Karabenick, 2011). Because help-seeking is connected with achievement, it would be of particular interest to understand which challenges high and low achieving students face with help-seeking, a question that has been unaddressed up to now. Therefore, this study observes how many and which specific challenges high and low achievers report while accomplishing a challenging task, how many and which of them are responded to with help-seeking, and at what stage in the process of solving challenges low and high achievers apply help-seeking. This study investigates learning journals of grammar school students (N=45, 62% female) using qualitative content analysis (Mayring, 2014). Results indicate that high achievers report more challenges and more help-seeking to tackle their challenges than low achievers. This is particularly the case when it comes to specific challenges regarding academic writing issues. In sum, our analysis leads to more insight into challenge-strategy-contingencies.

Knowledge is power – but you should use it!

Keywords: Achievement, Educational Psychology, Higher Education, Self-regulation

Presenting Author:Sebastian Trentepohl, Ruhr-Universität Bochum, Germany; **Co-Author:**Julia Waldeyer, Ruhr-University Bochum, Germany; **Co-Author:**Fleischer Fleischer, Ruhr-University Bochum, Germany; **Co-Author:**Julian Roelle, Ruhr University Bochum, Germany; **Co-Author:**Detlev Leutner, University of Duisburg-Essen, Germany; **Co-Author:**Joachim Wirth, Ruhr-University Bochum, Germany

Learning-strategy knowledge is regarded as an important prerequisite for successful learning. Models of self-regulated learning (SRL) assume that the process of SRL requires relevant learning-strategy knowledge as well as the ability to transfer this knowledge into efficient learning behaviour to influence learning performance. Empirical evidence on cognitive and metacognitive learning strategies indicates a mediating role of strategy use in this connection. However, whether a similar mediation also holds for resource management (RM) strategies needs empirical investigation, yet. Therefore, the aim of the present study was to investigate the generalizability of the mediating influence of learning-strategy use for RM strategies. A mediation model was proposed, in which RM strategy use functions as a mediator of the impact of RM strategy knowledge on academic performance. To test the model's assumptions, a seminar was designed in which N = 106 first-year students participated over the duration of one semester. RM strategy knowledge was assessed using the Resource-Management Inventory (Waldeyer et al., 2019). The seminar's content was provided via an online-learning platform which allowed the recording of corresponding log data as indicators for students' learning behaviour. Academic performance was assessed based on an exam at the end of the semester. The results indicate that students' RM strategy use was a significant mediator of the effect of RM strategy knowledge on academic performance and support the generalizability of its mediating influence for SRL in the context of RM learning strategies.

Regulation in Collaborative Learning: An Expert Study to Assess Immediacy of Regulation Strategies

Keywords: Collaborative Learning, Educational Psychology, Self-regulation, Student Learning

Presenting Author:Martin Greisel, University of Augsburg, Germany; **Co-Author:**Laura Spang, University of Augsburg, Germany; **Co-Author:**Markus Dresel, University of Augsburg, Germany; **Co-Author:**Ingo Kollar, University of Augsburg, Germany

At university, many students either have to work collaboratively in their courses or consciously decide to form self-organized study groups, e.g. to jointly prepare for exams. However, a wide range of different comprehension-related, motivational-affective, coordination- and resource-related problems may arise during collaboration. To learn and collaborate successfully, students need to regulate these problems with the help of appropriate strategies. Different regulation strategies can however be differently immediate for the solution of different problems. We therefore asked N = 109 international experts from research on Computer-Supported Collaborative Learning (CSCL) to assess for individual problem types to what extent they felt that different regulatory strategies would be immediately effective or not in an online questionnaire. We found that for comprehension problems, experts considered cognitive and metacognitive strategies equally often to be immediately effective. For coordination problems, metacognitive strategies are complemented by a recurring set of resource-oriented strategies and one motivational strategy. For motivational and resource problems, experts assessed motivational and resource-oriented strategies as immediately effective, respectively. In conclusion, when determining the fit between a given problem and a regulation strategy, this fit should be determined at

the concrete level of specific problems and strategies, not at the level of rather broad problem-category-to-strategy-category links. Practically, computer-supported learning environments should use this problem-strategy-assignment to scaffold learning with corresponding prompts or awareness tools.

Session F 12

23 August 2021 18:45 - 19:45

Session Room 14

Single Paper

Motivational, Social and Affective Processes

Educational Psychology and Motivation

Keywords: Attitudes and Beliefs, Comparative Studies, Educational Psychology, Higher Education, Mathematics, Motivation, Primary Education, Science Education

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Gertraud Benke, Klagenfurt University, Austria

Student academic motivation during the COVID-19 lockdown: A cross-country comparison

Keywords: Attitudes and Beliefs, Comparative Studies, Educational Psychology, Motivation

Presenting Author: Ana Camacho, University of Porto and Polytechnic Institute of Porto, Portugal; **Co-Author:** Nadine Correia, Instituto Universitário de Lisboa, Portugal; **Co-Author:** Sonia Zaccoletti, University of Padova, Italy; **Co-Author:** Cecília Aguiar, Instituto Universitário de Lisboa, Portugal; **Co-Author:** Lucia Mason, University of Padova, Italy; **Co-Author:** Rui Alexandre Alves, University of Porto, Portugal; **Co-Author:** João Daniel, ISPA - Instituto Universitário, Portugal

The COVID-19 outbreak has ravaged all societal domains, including education. Home confinement, school closures, and distance learning impacted students, teachers, and parents' lives worldwide. In this study, we aimed to examine the impact of COVID-19-related restrictions on Italian and Portuguese students' academic motivation as well as investigate the possible buffering role of extracurricular activities. Following a retrospective pretest-posttest design, 567 parents ($n_{Italy} = 173$, $n_{Portugal} = 394$) reported on their children's academic motivation and participation in extracurricular activities (grades 1 to 9). We used a multi-group latent change score model to compare Italian and Portuguese students. Estimates of latent change score models showed a decrease in students' motivation both in Italy and in Portugal, although more pronounced in Italian students. Results also indicated that the decrease in students' participation in extracurricular activities was associated with changes in academic motivation (i.e., students with a lower decrease in participation in extracurricular activities had also a lower decrease in motivation). Furthermore, students' age was significantly associated with changes in motivation (i.e., older students had a lower decrease). No significant associations were found for students' gender nor for parents' educational level. This study sheds light on students' academic motivation during home confinement, school closures, and distance learning as restrictive measures adopted to contain a worldwide health emergency. We contend that teachers need to adopt motivation-enhancing practices as means to prevent the decline in academic motivation during exceptional situations.

The Science Task Value Dynamics among Elementary students – A Longitudinal Study from Grade 1 to 5

Keywords: Educational Psychology, Motivation, Primary Education, Science Education

Presenting Author: Janica Vinni-Laakso, University of Helsinki, Finland; **Co-Author:** Lauri Hietajärvi, University of Helsinki, Finland; **Co-Author:** Kalle Juuti, University of Helsinki, Finland; **Co-Author:** Anni Loukomies, University of Helsinki, Finland; **Co-Author:** Katariina Salmela-Aro, Helsinki University, Finland

According to the situated expectancy-value model (Eccles & Wigfield, 2020) students' motivational beliefs are differentiated into outcome expectancies, subjective task values, and perceived cost in learning considered as interacting and influenced by the situations. The present study examined the longitudinal within-person dynamics of students' science-related self-concept, interest and cost using a five-wave dataset gathered among 479 Finnish elementary students (44.9 % male, age 7–11) and a random intercept cross-lagged panel model. The best fitting model implied that the dynamics follow a stationary process with some autocorrelation stability over a one-year lag, and no evidence of gender moderation. The model indicated that when students showed elevated cost, they showed lowered interest the following year, whereas no evidence of the reverse relationship was found. Moreover, the fluctuations of self-concept showed no association with interest or cost over time, but there were temporary associations showing that when students experienced elevated interest their self-concept was higher, or when they experienced elevated cost both interest and self-concept were simultaneously lower. Similarly, on the between-student level, students with higher science related self-concept showed also higher interest, and students with higher cost showed lower interest and self-concept. Boys showed higher cost in science learning. As such, these results suggest that perceived cost is a key element that might jeopardize elementary students' science motivation and boys might be at the greater risk to this negative effect. More research focusing on intra-individual processes is needed to form a more comprehensive understanding of students' science motivation formation.

Short-Term Relations Between Students' Situated Expectancies and Task Values in the Math Domain

Keywords: Educational Psychology, Higher Education, Mathematics, Motivation

Presenting Author: Daria Katharina Benden, TU Dortmund University, Germany; **Co-Author:** Fani Lauermann, TU Dortmund University, Germany

Students' expectancies and task values play a critical role in shaping their educational choices. Eccles et al.'s situated expectancy-value theory posits that students' educational choices and the underlying expectancy-value beliefs leading to these choices are not only shaped by long-term, developmental processes but also affected by more proximal processes that operate over short periods of time. Yet, little is known about short-term relations of students' expectancy-value beliefs, for instance, over the first weeks of one semester in college, and whether findings from longer time periods translate to the short-term. In the present study, we assessed college students' content-specific expectancies and task values in gateway math courses in four weeks at the beginning of their math-intensive study programs ($N = 773$). Random intercepts cross-lagged panel models including students' expectancy and different subjective task value facets (i.e., intrinsic and utility value, psychological and effort cost) showed that trait-like components of students' expectancies and task values were significantly associated with each other as were contemporaneous correlations of students' situation-specific expectancies and task values. However, the analyses revealed little evidence of significant cross-lagged effects from students' situation-specific expectancy on subsequent changes in task values and vice versa after controlling for stable interindividual differences. Results suggest that students' expectancy and task values are jointly shaped by stable individual characteristics as well as situational factors but we did not find notable spillover effects across situations. Further research is needed to examine the role of situational characteristics or non-motivational factors like performance feedback in these processes.

Session F 13

23 August 2021 18:45 - 19:45

Session Room 9

Single Paper

Assessment and Evaluation, Learning and Social Interaction

Conversation and Discourse Analysis

Keywords: Conversation/Discourse Analysis, Early Childhood Education, Language (L1/Standard Language), Out-of-School Learning, Science Education, Social Interaction, Teaching/Instruction, Video Analysis

Interest group: SIG 01 - Assessment and Evaluation, SIG 05 - Learning and Development in Early Childhood, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Katrien Cuyvers, Netherlands

Student resources as mediational means in school science conversations

Keywords: Conversation/Discourse Analysis, Out-of-School Learning, Science Education, Social Interaction

Presenting Author: Anniken Furberg, University of Oslo, Norway; **Presenting Author:** Kenneth Silseth, University of Oslo, Norway

The present study investigates how students' experiences, ideas and assumptions from the realm of their everyday lives can become mediational means in whole-class conversations in school science. By taking an ethnomethodological approach and a sociocultural perspective on learning and teaching, the study explores how a teacher orient to and appropriate resources that students themselves bring into the science conversations to support student participation. The data derives from a science project about genetics, involving a class of lower secondary school students and their teacher. The analytical focus is on student-teacher interactions taking place in whole-class sessions. The analyses show that the student resources became mediational means in the sense of enabling students to formulate and provide complex scientific reasoning, as well as providing the teacher insight to the students' scientific ideas and challenges. Furthermore, the student resources became mediational means in the sense of promoting student participation, engagement and scientific curiosity. However, how student resources become mediational means is also dependent on the distribution of authoritative roles between students and the teacher in whole-class dialogues. We discuss the challenges that the teacher faces in this type of setting and point to implications for instructional design.

We play the future: Exploring digital transformation in kindergarten through pretend play

Keywords: Conversation/Discourse Analysis, Early Childhood Education, Science Education, Video Analysis

Presenting Author: Lena Hollenstein, University of Teacher Education St.Gallen, Switzerland; **Presenting Author:** Franziska Vogt, St.Gallen University of Teacher Education, Switzerland

Digital transformation is shaping futures. To generate interest for professions in the field of information technology, early role models and a playful identification with activities and professions in the context of digitalisation are required. Children learn in pretend play what society considers important. The potential of pretend play for creatively imagine digital transformation has not yet been explored. The project "we play the future" initiated guided pretend play in kindergarten to enable children to appropriate processes of digital transformation. Eight different free play impulses have been developed. Existing corners of pretend play in kindergarten were extended, i.e. the home corner becoming a smart home corner, and new corners for free pretend play were created, such as an ICT-Centre. Materials support pretend play (i.e. old laptops, wooden tablets) but no functioning technology is used, as the focus lies on understanding the concept of digital transformation. Fifteen kindergarten implemented the free play impulses. Children's play was videographed. Using multimodal interaction analysis, the following research questions are examined: (I) in what ways do children explore the concept of digital transformation in free play? (II) in what ways do early childhood educators support the pretend play of girls and boys in a gender sensitive pedagogical approach? First results show, that children expand on digital functions and imagine new technical possibilities. The discussion will address the potential of free play, the challenges of promoting gender equality in the area of STEM and the competencies required for early childhood educators to support free play.

Examining the product and process features in the oral narratives of young children

Keywords: Conversation/Discourse Analysis, Early Childhood Education, Language (L1/Standard Language), Teaching/Instruction

Presenting Author: Anna Llaurado, UCL, United Kingdom; **Co-Author:** Emma Sumner, UCL, United Kingdom; **Co-Author:** Jessica Massonne, UCL, France; **Co-Author:** Julie Dockrell, Institute of Education, United Kingdom

Oral language skills at school entry are fundamental to learning and academic achievement. Pedagogy and assessment should reflect current understandings of the key components of oral language at different points in development. Narrative skills are a key dimension of oral language skills at the start of formal education. Producing a narrative is a challenging task that requires assembling words in sentences and linking sentences into a coherent passage. Research has shown that children's ability to produce a narrative changes in important ways at five years of age. The characteristics of the narratives produced by young children have been more extensively explored at the micro level features (choice of words and syntax) than the macro level (overall structure and cohesion), but the process of producing a narrative (i.e., examining dysfluencies: repetitions, repairs and pauses) remains largely under researched. We examined the oral narratives of 101 children at the start of formal education in England (51 children in Reception ($M_{Age} = 57.4$ months); 50 in Year 1 ($M_{Age} = 69.4$ months)).

Narratives were analysed for both micro and macro level features and language dysfluencies were recorded. Children in Year 1 used more macro level features than their Reception-aged peers. By contrast neither use of micro level features nor dysfluencies changed with age at this stage. However, types of dysfluencies were related to the child's language skills.

Session F 14

23 August 2021 18:45 - 19:45

Session Room 12

Single Paper

Lifelong Learning

Educational Psychology

Keywords: Argumentation, Cooperative/Collaborative Learning, Educational Psychology, Motivation, Out-of-School Learning, Parental Involvement in Learning, Social Interaction

Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Benzi Slakmon, Tel Aviv University, Israel

Parental involvement in homework during Covid-19 confinement in Spain

Keywords: Educational Psychology, Motivation, Out-of-School Learning, Parental Involvement in Learning

Presenting Author: Natalia Suárez-Fernández, University of Oviedo, Spain; **Co-Author:** José Carlos Núñez, University of Oviedo, Spain; **Co-Author:** Estrella Fernandez Alba, University of Oviedo, Spain; **Co-Author:** Pedro Rosário, Universidade do Minho, Portugal

During the first months of Covid 19 pandemic in Spain, teaching and learning were online activities, and parents had to get involved in students' homework in the middle of a stressful health crisis. The purpose of this study was to compare parents' involvement in students' homework during the confinement and in normal circumstances, as well to examine different family characteristics (number of children, children with special education needs, parents' working conditions, amount and type of students' homework). 628 parents of elementary and secondary school students answered an online questionnaire about their family circumstances and their involvement in students' homework (*The Parental Homework Management Scale-PHMS*). The results showed that parents' homework involvement increased during the confinement, especially when they had to help their children send homework to the teacher. Besides, a child with special needs in the family was associated with more parental involvement in their children's homework. However, the amount of students' homework was not related to parents being more involved. Homework was not a matter of quantity but rather quality or utility of tasks in addition to family resources to help.

Developing Argument Skill Through Collaborative Engagement in Argumentation

Keywords: Argumentation, Cooperative/Collaborative Learning, Educational Psychology, Social Interaction

Presenting Author: Kalypso Iordanou, University of Central Lancashire, Cyprus; **Co-Author:** Dora Tzialli, University of Central Lancashire Cyprus, Cyprus

We examine the effectiveness of a dialog-based argument curriculum in supporting students' argument skill, focusing particularly on the role of providing peer feedback. We report on two studies involving 142 primary school students. Study 1 examined students' ability to take multiple considerations into account when reasoning about a socio-scientific topic, after engagement in an argument curriculum. Study 2 compared three experimental conditions to examine the role of peer feedback on argumentation, in developing argument skill. Results of two studies showed that engagement in dialogic argumentation can promote individuals' argument skill, particularly their ability to produce different types of arguments (Study 1) and using evidence to weaken others' position (Study 2). Providing feedback to peers about their arguments, in addition to engage in dialog-based curriculum, was found superior to promote argument skill compared to either sole engagement in the curriculum or engagement in the curriculum along with receiving peer feedback.

Session F 15

23 August 2021 18:45 - 19:45

Session Room 15

Invited Symposium

Learning and Instructional Technology

SIG 7: What Machine Learning Offers to Learning and Instruction: Potential & Ethical Considerations

Keywords: Artificial Intelligence, Educational Technology, Experimental Studies, Higher Education, Instructional Design, Learning Analytics, Learning Technologies, Reading Comprehension

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Margot van Wermeskerken, Netherlands

Organiser: Andreas Lachner, University of Tübingen, Germany

Discussant: Paul Prinsloo, South Africa

Machine learning is regarded as one of the hot topics in the current decade, as it has the potential to push advancements in science, society, and economy. Machine learning is an application of artificial intelligence (AI) which requires computers to learn from real-world data, allowing them to make predictions and informed decisions, that is, behave intelligently. Therefore, machine learning has the potential to contribute to education, as it 1) allows to enhance adaptive learning environments supporting students' self-regulated learning, as well as 2) assist teachers during the complex task of teaching, for instance by providing real-time computer-generated information about students' learning processes. Although the use of machine learning in the context of education is appealing, research about whether and how machine learning can be implemented in contexts of learning and instruction is still in its infancy. Therefore, the three contributions to this symposium draw on innovative machine learning applications in the context of individualized learning (i.e., reading comprehension, cognitive load) and teacher support during instruction (formative assessment of students' learning processes), and provide empirical evidence regarding their effectiveness. Furthermore, the symposium contributes to the ethical discussion on the use of machine learning in learning and instruction, by discussing the three approaches in terms of ethical consequences and trustworthiness in order to draw a comprehensive picture of the legitimate use of machine learning in education.

Predictive models of self-explanation in reading comprehension

Presenting Author: Rosemary Southwell, University of Colorado at Boulder, United States; **Co-Author:** Caitlin Mills, University of New Hampshire, United States; **Co-Author:** Sidney D'Mello, University of Colorado Boulder, United States

It is known that eye movements during reading reflect various reading processes as well as reader skill and attentiveness, but there is little work relating eye movements to reading comprehension outcomes. We trained models to predict the quality of responses to open-ended (self-explanation) prompts during reading, and found the model predictions to generalize across participants and to offline measures of reading comprehension in a separate study where reading was uninterrupted. This work represents a novel step by showing that comprehension at a deep level during reading can be predicted from eye movements in a person-independent manner. Our results have implications both for theories of reading and for the design of machine-learning-based real-time learning interventions in intelligent tutoring systems.

How the Design of Teacher Tools Based on Learning Analytics May Be Shaped by Different Use Scenarios

Presenting Author: Vincent Aleven, Carnegie Mellon University, United States; **Co-Author:** Bruce McLaren, Carnegie Mellon University, United States; **Co-Author:** Franceska Xhakaj, Carnegie Mellon University, United States; **Co-Author:** Kenneth Holstein, Carnegie Mellon University, United States

Past research has documented advantages of teacher support tools that use AI-based learning analytics, such as classroom orchestration tools and dashboards. However, research is still scarce regarding how the design of these tools might need to vary, depending on the specific use scenario. Over the past five years, we have developed several analytics-based teacher tools for use with an intelligent tutoring system (ITS). We worked extensively and closely with teachers to make sure that the tools truly serve their needs. The talk presents, compares, and contrasts two of these tools designed for different use scenarios. First, Luna is a prototype front-end for a dashboard for lesson planning. In a study with 5 teachers from 17 middle-school classes, we found that Luna helps teachers tailor their lesson plans and lessons, although more sustained use may be needed to have an influence on student learning. Second, Lumillo is a mixed reality, real-time analytics tool that supports individualized helping by teachers, while students are using an ITS. In a study with 343 middle school students, across 18 classrooms, with 8 teachers, we found that when teachers use Lumillo, their students learn significantly more, with students coming in with lower domain knowledge benefiting the most. We discuss similarities and differences in the design of these tools, in particular, differences based on different usage scenarios. Ultimately, comparisons such as the current may lead to generalized design knowledge regarding how teacher analytics tools should be designed for different use scenarios, learning contexts, and teacher preferences.

Can and Should we Assess and Optimize Learners' Engagement and Cognitive Load with Machine Learning?

Presenting Author: Peter Gerjets, Institut für Wissensmedien / University of Tuebingen, Germany; **Co-Author:** Birgit Brucker, Leibniz-Institut für Wissensmedien (IWM), Germany; **Co-Author:** Christian Schärling, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:** Enkelejda Kasneci, University of Tübingen, Germany

In recent years, combining (1) advanced sensor technologies (e.g., eye tracking, touch and physiological sensors, high-resolution cameras) and (2) machine learning approaches (e.g. classifiers based on support-vector machines or neural networks trained to detect systematic patterns in theses sensor data) has provided novel avenues in the field of learning and instruction to address pivotal theoretical, empirical, and practical issues. In this contribution we will offer some examples for this claim from our own research on assessing and optimizing learners' active engagement in learning processes as well as their cognitive load (CL) imposed by these activities. For classroom learning, cognitive activation - i.e. students' cognitive engagement elicited by teaching - has been identified as a core variable in research on teaching quality. Similarly, for individual learning, students' active engagement and the CL imposed by these activities have been recognized as two key variables for optimizing instructional scenarios and for the adapting instruction to students' individual needs. Therefore, there is a broad consensus in research on learning and instruction that these two variables strongly determine individual learning outcomes and achievements. Our examples for applying machine learning to assess theses variables cover the use of eye-tracking, electroencephalography (EEG), touch and camera data and demonstrate what CAN (in principle) be done with these novel approaches. Based on these examples, we will also reflect from a more normative perspective what (actually) SHOULD be done with these technologies in research and practice based on important ethical considerations that need to be taken into account.

Session G 1

24 August 2021 09:00 - 10:00

Session Room 10

Single Paper

Higher Education, Motivational, Social and Affective Processes

Motivation

Keywords: Assessment Methods and Tools, Developmental Processes, Higher Education, Learning Approaches, Metacognition, Motivation, Pre-service Teacher Education, Reflection, Social Aspects of Learning and Teaching

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion

Chairperson: Kirsti Lonka, University of Helsinki, Finland

University students' epistemic profiles, study engagement, self-regulation and interest

Keywords: Higher Education, Metacognition, Motivation, Reflection

Presenting Author:Kirsti Lonka, University of Helsinki, Finland; **Co-Author:**Elina E. Ketonen, University of Helsinki, Finland; **Co-Author:**Jan Vermunt, Eindhoven University of Technology, Netherlands

The aim of this study was to look at Finnish university students' epistemic profiles in relation to their motivation and experienced challenges in studying. The participants were 1515 students from five faculties who completed questionnaires on study engagement, lack of regulation and the lack of interest (meaning) in the contents of their studies. A subsample of 1st and 2nd year students also completed a questionnaire about the certainty of their career choice. In a previous study, we conducted latent profile analysis that revealed three epistemic profiles: *Pragmatic* (49%), *reflective-collaborative* (26%) and *fact-oriented* (25%). In the present study, we compared the study engagement, lack of regulation, lack of interest and certainty of career choice across these profiles. The *reflective-collaborative* group, whose academic achievement was the highest, scored highest on study engagement and on certainty of their career choice. They were also the least likely to express either lack of regulation or interest. The *fact-oriented* group scored highest on lack of interest. As compared to the *fact-oriented* group, the *pragmatic* group scored next highest on lack of interest, equally high on lack of regulation and equally low in certainty of career choice. Thus, epistemic beliefs (that constitute epistemic profiles) were related not only to academic achievement, but to university students' motivation and challenges in studying across disciplines. The epistemic stance may colour the way students perceive their learning environment. An ongoing follow-up study shall show the changes during undergraduate years.

Investigating the links between learning approach, epistemic beliefs, motivation and social support

Keywords: Higher Education, Learning Approaches, Motivation, Social Aspects of Learning and Teaching

Presenting Author:Manuel Bächtold, University of Montpellier, France; **Co-Author:**Jacqueline Papet, University of Montpellier, France; **Co-Author:**Dominique Barbe Asensio, University of Montpellier, France; **Co-Author:**Sandra Borne, University of Montpellier, France; **Co-Author:**Kévin De Checchi, University of Montpellier, France; **Co-Author:**Agnieszka Jezierski, University of Montpellier, France; **Co-Author:**Philippe Gabriel, University of Avignon, France; **Co-Author:**Florence Cassignol, University of Perpignan, France

This talk presents an empirical study which aims to explore the links between approach to learning (AL), epistemic beliefs (EB), motivation (MT), and perceived social support and training climate (SC). For conceptual clarity, in this study, EB was separated from AL, and MT also separated from AL. The four dimensions were defined in terms of several sub-dimensions. The links between AL, EB, MT and SC were explored quantitatively via a questionnaire which was completed by 1712 first-year students in various training programs at university. The findings corroborate previous research on the strong links between AL and MT, but question the idea that deep AL would be exclusively related to intrinsic MT. Consistent with a previous model supported in the literature, MT appears as a mediating dimension between SC and AL. However, the similar values of the EB-AA and EB-MT correlations do not confirm another model according to which MT would be a mediating dimension between EB and AL.

Introducing a dynamic situated expectancy-value model of moment-to-moment developmental dynamics

Keywords: Assessment Methods and Tools, Developmental Processes, Motivation, Pre-service Teacher Education

Presenting Author:Julia Moeller, Universität Leipzig, Germany; **Co-Author:**Jaana Viljaranta, University of Eastern Finland, Finland; **Co-Author:**Asko Tolvanen, University of Jyväskylä, Finland; **Co-Author:**Julia Dietrich, Friedrich-Schiller-University Jena, Germany

This study introduces a new theoretical model describing the moment-to-moment development of expectancy-value experiences, based on dynamic systems concepts. As a first step to testing this model, we examined whether task values and success expectancies measured in a learning situation (time point t) predicted themselves and each other at the next situation (t + 1).Situational task values and expectancies were assessed using the experience sampling method in 155 University teacher training students during weekly lectures for one semester, with three surveys during each weekly lesson. Data were analyzed with a multilevel cross-lagged structural equation model.Expectancies and task values were concurrently correlated within situations. Expectancies showed rank-order stability for from one learning situation to the next, whereas task values did not. No cross-lagged effects between expectancies and most task values were found.We expect the proposed dynamic situated expectancy-value model to have a substantial impact on further theory development.

Session G 2

24 August 2021 09:00 - 10:00

Session Room 8

Single Paper

Culture, Morality, Religion and Education, Higher Education

Self-efficacy and Teacher Effectiveness

Keywords: Attitudes and Beliefs, Higher Education, Self-efficacy, Teacher Effectiveness, Teacher Professional Development

Interest group: SIG 04 - Higher Education, SIG 19 - Religions and Worldviews in Education

Chairperson: Izaak Dekker, Erasmus University Rotterdam, Netherlands

Measuring teachers' teaching self-efficacy beliefs in higher education

Keywords: Higher Education, Self-efficacy, Teacher Effectiveness, Teacher Professional Development

Presenting Author:Irene Douwes-van Ark, University of Groningen, Netherlands; **Co-Author:**Ine Noben, University of Groningen, Netherlands; **Co-Author:**Jan Folkert Deinum, University of Groningen, Netherlands

Professional development programmes (PDP) are gaining ground in higher education. However, it remains unclear why some academic teachers get more out of PDP than others. Research in primary and secondary education has shown that teachers with high self-efficacy beliefs are more likely to use the instructional knowledge and skills acquired from PDP. Research on self-efficacy in higher education is scarce and a widely-accepted self-efficacy instrument is lacking. This study aims to validate a self-efficacy survey for higher education, making use of a sample of 115 academic teachers participating in a PDP. Our first results demonstrate a four-factor structure: student engagement, instructional practice, classroom management and course design.

Does spirituality or religiosity make a difference in explaining teachers' professional beliefs?

Keywords: Attitudes and Beliefs, Self-efficacy, Teacher Effectiveness, Teacher Professional Development

Presenting Author:Manfred L. Pirner, University of Erlangen-Nuremberg, Germany; **Co-Author:**Marcus Penthin, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

Teachers' beliefs are known to be important for their professional thinking and acting. However, there is only scarce evidence on how their personal beliefs, especially their religious and spiritual beliefs, may be linked to their professional beliefs. Based on theoretical deliberations as well as on the few, mainly qualitative studies available, we hypothesized that teachers' religious beliefs as well as their closely related spiritual beliefs correlate with their beliefs on teaching and learning. To a sample of N = 1,441 German schoolteachers we administered scales on spiritual, religious and professional beliefs, the latter including a) teachers' attitude towards positive error culture, b) orientation to the individual students, c) professional idealism and d) professional self-efficacy. Structural Equation Modelling including either religiosity or spirituality as predictors and professional beliefs as criteria revealed only very small explanatory value of religiosity in all four teachers' professional beliefs ($R^2 \in [.01; .04]$). Yet, there were substantial effects for spiritual beliefs regarding "connectedness with others" and "connectedness with oneself", which in turn are linked to "transcendent, religious beliefs", with teachers' professional self-efficacy expectations having the highest explanatory value ($R^2 \in [.08; .24]$). As a conclusion, this study has provided evidence that German teachers' spirituality and – to a very small degree – religiosity does make a difference, but only in certain characteristic features and to a moderate extent. Nevertheless, these results suggest the consequence that possible links between teachers' spiritual or religious beliefs and their profession should be the subject of teacher education and training.

Session G 3

24 August 2021 09:00 - 10:00

Session Room 12

Single Paper

Teaching and Teacher Education

Pre-service Teacher Education

Keywords: Competencies, Conversation/Discourse Analysis, Design-based Research, Game-based Learning, Higher Education, Physical Sciences, Pre-service Teacher Education, Problem-based Learning, Teacher Professional Development, Teaching Approaches

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Florencia Gomez Zaccarelli, Pontificia Universidad Católica de Chile, Chile

Unsolvable gender problems – postfeminist discourses in the talk of future physics teachers

Keywords: Conversation/Discourse Analysis, Higher Education, Physical Sciences, Pre-service Teacher Education

Presenting Author:Johanna Larsson, Uppsala University, Sweden; **Co-Author:**Anders Johansson, Chalmers University of Technology, Sweden

Physics is a field which has historically been studied by men to a larger extent than women, and it is still one of the least gender equal fields in science. In this study, we ask how future physics teachers are equipped to deal with the complex issues of gender diversity in relation to the subject of physics in their teaching practice.We use individual and group interviews with 27 future physics teachers at two large Swedish universities. We analyse the discourses invoked in talk about the problems and solutions to gender issues in physics. Three prevailing discourses are identified: Inequality in science is a thing of the past; Science and physics knowledge is neutral and thus studying it is in principle equally accessible to everyone; Secure knowledge is only possible through the methods of natural science, which renders knowledge about gender issues precarious.In combination, we see these discourses as limiting the possible ways of understanding and explaining gender issues in physics available to the future teachers. We argue that this represents a "postfeminist" understanding of the problem where "equality" is taken for granted. Our interviewees have received, and in some cases appreciated, diversity training in the pedagogy section of their teacher education. However, they remain ill-equipped to approach issues of gender and diversity in relation to the subject of physics itself. We suggest this represents a missed opportunity for physics teacher education to empower future physics teachers to address gender and diversity issues.

Comparing three interventions to promote diagnostic competence in pre-service teachers

Keywords: Game-based Learning, Pre-service Teacher Education, Problem-based Learning, Teacher Professional Development

Presenting Author:Lea Grotzegut, Universität Paderborn, Germany; **Co-Author:**Katrin Klingsieck, Universität Paderborn, Germany

Assessing students' cognitive, motivational, and emotional learning predispositions is an essential prerequisite of adaptive and thus effective teaching. Teachers can judge students' motivation and performance with moderate to good accuracy but have difficulties judging emotional aspects. However, teacher judgements can have a large impact on students' school career, their academic self-concept and personal development. Yet, little is known about how diagnostic competence is best promoted.This paper presents the comparison between three interventions to promote diagnostic competence in preservice teachers: a problem-based learning setting, a digital game-based learning setting, and a teacher-oriented setting, all including group work. The pretest-posttest-follow up design includes a sample of $N = 166$ teacher education students.Self-efficacy increased across all groups over the course of the semester. The game-based group showed higher interest than both other groups. Intrinsic motivation was higher in the game-based group than the problem-based group. Extraneous cognitive load was higher in the problem-based group than the game-based group. Descriptive data show that knowledge increased continuously from pretest to follow-up in the teacher-oriented group, whereas it increased from pretest to posttest but declined from posttest to follow-up in both the problem-based and game-based group. A teacher-oriented intervention might therefore be best suited to promote long-term basic diagnostic knowledge. A game-based intervention, however, seems to be best suited to motivate students intrinsically and reduce cognitive load. A combination of a teacher-oriented and game-based intervention to train diagnostic competence is therefore recommended.

Practice-based Teacher Education: Learning Sequence through Collaboration and Critical Thinking

Keywords: Competencies, Design-based Research, Pre-service Teacher Education, Teaching Approaches

Presenting Author:Alejandra Meneses, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Miguel Nussbaum, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Maria Graciela Veas, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Silvana Arriagada, Pontificia Universidad Católica de Chile, Chile

Critical thinking and collaboration are 21st-century skills that should be taught in schools to facilitate the development of critical and participatory citizens. However, few studies have focused on how practice-based teacher education can prepare prospective teachers to develop these skills in their students. This study aims to design and test a learning sequence that integrates pedagogies of practice with collaboration and critical thinking, and determines the prospective teachers' performance. Fourteen prospective teachers were asked to perform a set of core practices and a write a reflection that analyzed their performance. The results show the learning sequence in which activities are incorporated, especially approximations to practice, focusing on practical learning, modalities and duration. In the performance segment of the study, the future teachers achieved 63.3% when *implementing organizational routines*—the highest performance-- while *providing feedback* produced the lowest performance. With respect to written analysis, prospective teachers achieved 66.6% with a score of 1.75 in critical thinking skills which is equivalent to an achievement of less than 50%. Also, there was a moderate negative non-significant relation between both tasks which raises questions about tasks, modes, and moments for reflection and feedback on practice. This article, from the perspective of practice-based education, offers the field tools, activities and a specific learning sequence to foster not only the enactment of core practices through pedagogies of practice but also through 21st-century skills.

Session G 4

24 August 2021 09:00 - 10:00

Session Room 7

Single Paper

Learning and Instructional Technology

Game-based Learning in Mathematics

Keywords: Cognitive Skills, Game-based Learning, Mathematics, Meta-analysis, Motivation, Neuroscience, Primary Education, Student Learning

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 08 - Motivation and Emotion, SIG 27 - Online Measures of Learning Processes

Chairperson: Leonie Johann, Norway

A game-based approach to promoting adaptive expertise with rational numbers

Keywords: Cognitive Skills, Game-based Learning, Mathematics, Primary Education

Presenting Author:Jake McMullen, University of Turku, Finland; **Co-Author:**Antti Koskinen, University of Tampere, Finland; **Co-Author:**Tomi Kärki, University of Turku, Finland; **Co-Author:**Antero Lindstedt, University of Tampere, Finland; **Co-Author:**Saku Määttä, University of Turku, Finland; **Co-Author:**Erno Lehtinen, University of Turku, Finland; **Co-Author:**Minna Hannula-Sormunen, University of Turku, Finland; **Co-Author:**Kristian Kiili, Tampere University, Finland

Game-based learning environments have been shown to be promising means to support skills and knowledge related to the development of adaptive expertise. In order to examine the possibilities to promote adaptive expertise with rational number knowledge we report on the effects of a game-based learning environment to promote seventh-grade students' rational number knowledge. Based on results from a quasi-experimental study, the game-based learning environment was successful in promoting rational number knowledge. The learning environment appeared to support students' mental calculation with rational numbers and their conceptual knowledge of rational number magnitudes and representations. As well, students who played the games outperformed the control group on a measure of adaptive rational number knowledge at post-test. These results provide the first evidence of possibilities to support knowledge that is

needed for adaptive expertise with rational numbers.

Effects of Digital Games on Student Motivation in Mathematics: A Meta-analysis in K-12

Keywords: Game-based Learning, Mathematics, Meta-analysis, Motivation

Presenting Author:Daniela Fadda, University of Cagliari, Italy; **Presenting Author:**Marta Pellegrini, University of Florence, Italy; **Co-Author:**Giuliano Vivani, University of Cagliari, Italy; **Co-Author:**Claudio Zandonella Callegher, University of Padua, Italy

Motivation, broadly studied within the school setting from the expectancy-value perspective, is an important factor in the learning process and it has a relevant role in students' outcomes. Motivated students, who present positive beliefs about their academic skills (expectancy) and show interest, benefit, and enjoyment in carrying out a task (value), tend to engage in-class activities and to perform better over time, especially in mathematics. This study provides a multilevel meta-analysis relating to the impact of digital games on K-12 student motivation in mathematics. A total of 20 primary studies (43 effect sizes) meeting eligibility criteria was included. Standardised measure of effect size (d_{ppc2}) for pre- post-control group designs was used, and different sources of dependency among the effects were considered. Moreover, we examined whether specific characteristics of the motivational construct, participants, and interventions were associated with effect size differences. Results showed a significant overall effect ($d_{ppc2} = 0.27$; 95%CI = [0.14; 0.41]) and a great heterogeneity between studies. Moderator analyses revealed differences in effects associated with the motivational construct (higher effect size for studies which measured motivation in terms of expectancy compared to subjective values) and to the duration of the intervention (higher effect size for short interventions in respect to longer ones). Implications for interventions in mathematics education and for future research are discussed, arguing for the promotion of students' confidence in their abilities and positive perception of mathematics.

Game elements increase engagement: Evidence from multimodal data sources

Keywords: Game-based Learning, Mathematics, Neuroscience, Student Learning

Presenting Author:Manuel Ninaus, University of Innsbruck, Austria; **Co-Author:**Kristian Kiili, Tampere University, Finland; **Co-Author:**Korbinian Moeller, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Guilherme M. de O. Wood, University of Graz, Austria; **Co-Author:**Silvia Kober, University of Graz, Austria

There is a need for building models using (neuro-)physiological and behavioral process data along with self-reports to better understand the role of emotions in learning processes. To address this, we report a study in which the combination of the neurofunctional, game log and self-report data were collected to shed light on underlying mechanisms of game-based learning. In particular, in a within-subject study design, 59 healthy adults completed a non-game based version and a game-based version of the number line estimation task. Participants' brain activity was monitored using Near-infrared spectroscopy (NIRS) and playing performance was logged. While the log files indicated that performance in the learning task was comparable between conditions, participants reported more positive affect when interacting with the game-based as compared to the non-game-based learning task. Moreover, participants rated the game-based task to be more stimulating, novel, and attractive. These self-reports were corroborated by increased activation in brain areas associated with reward and emotion processing while using the game-based learning task. Moreover, we identified increased activation in frontal brain areas involved in attentional processes during the game-based learning task. The current study demonstrated the benefits of utilizing multimodal process data together with conventional self-reports and game performance log files to better understand the cognitive, behavioral, and emotional aspects of game-based learning. Converging evidence from different data channels suggests that game-based learning tasks seem to be more emotionally engaging and rewarding than conventional learning tasks.

Session G 5

24 August 2021 09:00 - 10:00

Session Room 1

Single Paper

Higher Education, Instructional Design

Computer-assisted Learning in Higher Education

Keywords: Computer-assisted Learning, Experimental Studies, Higher Education, Instructional Design, Interdisciplinary, Problem-based Learning, Student Learning

Interest group: SIG 04 - Higher Education, SIG 06 - Instructional Design

Chairperson: Marjolein Deunk, University of Groningen, Netherlands

Effects of Adaptive Quizzing: The Type of Adaptation Matters

Keywords: Computer-assisted Learning, Experimental Studies, Instructional Design, Student Learning

Presenting Author:Niklas Obergassel, Ruhr University Bochum, Germany; **Co-Author:**Svenja Heitmann, Ruhr-Universität Bochum, Germany; **Co-Author:**Stefan Fries, University of Bielefeld, Germany; **Co-Author:**Kirsten Berthold, University of Bielefeld, Germany; **Co-Author:**Axel Grund, University of Luxembourg, Luxembourg; **Co-Author:**Julian Roelle, Ruhr University Bochum, Germany

Providing learners with quiz questions that target new learning content has emerged as a solid approach to support learning. Furthermore, research shows that the benefits of quizzing can be further enhanced by adapting quiz questions to learners' expertise using self-assessments of performance or subjective cognitive demands ratings. However, although both demands-based and performance-based adaptations have proven effective, they have never been empirically compared regarding their effectiveness. Moreover, despite research from other fields indicating that a combination of both types of adaptation could yield an even more beneficial adaptation, demands-based and performance-based-adaptations have not been tested in their combined effect in quizzing specifically. In the present study we addressed these issues by comparing the effects of demands-adapted, performance-adapted, as well as two forms of demands-and-performance-adapted quizzing with the effects of non-adaptive quizzing and note-taking (control condition) in a laboratory experiment with $N = 246$ university students. We found a superiority of non-adaptive quizzing and all types of adaptive quizzing over note-taking as well as a superiority of demands-adapted quizzing over performance-adapted quizzing. Furthermore, we found that demands-adapted quizzing, but not performance-adapted or demands-and-performance-adapted quizzing yielded superior learning outcomes than non-adaptive quizzing, and that the two forms of demands-and-performance-adapted quizzing did not result in higher learning outcomes than pure demands-adapted or performance-adapted quizzing. Our results indicate that the emergence of an adaptation effect depends on the type of adaptation and that, to date, demands-adapted quizzing seems to be the most robust option to enhance the benefits of quizzing.

Peer feedback for undergraduate interdisciplinary learning

Keywords: Computer-assisted Learning, Higher Education, Interdisciplinary, Student Learning

Presenting Author:Rianne van Lambalgen, Utrecht University, Netherlands

This study investigates and compares online and face-to-face peer feedback of students for interdisciplinary learning. 'Interdisciplinary Research I' is a second-year core course within the bachelor Liberal Arts and Sciences, Utrecht University, where students of different disciplinary specializations collaborate to answer an interdisciplinary research question. As part of the interdisciplinary research process, they each write a different disciplinary contribution, for which it is important to have disciplinary knowledge, both content knowledge as well as knowledge on the disciplinary epistemology (Repko and Szostak, 2020). Through a questionnaire filled out by students after either online or face-to-face peer feedback, this study examines how online and face-to-face peer feedback effect disciplinary learning. Results show that although students in both groups find that peer feedback has improved their writing, disciplinary learning is higher in the face-to-face condition. Qualitative comments in the questionnaire show that students value the opportunity for interaction in face-to-face feedback. On the other hand, characteristics of online feedback that students value are the flexibility and the opportunity to give and receive more critical peer feedback. Overall, the results indicate that online feedback is beneficial in terms of logistics, flexibility and critical feedback, but that especially in interdisciplinary learning it is important to facilitate discussion and interaction after receiving peer feedback, either online or face-to-face.

Investigating the Effectiveness of Role-Play Patient Simulations in Dental Education

Keywords: Computer-assisted Learning, Higher Education, Instructional Design, Problem-based Learning

Presenting Author:Elizabeth McAlpin, New York University, United States; **Co-Author:**Marci Levine, New York University, United States; **Co-Author:**Jan L. Plass, New York University, United States

This study investigates two types of patient simulations, role-play and web-based, on learningoutcomes for two topics, local anesthesia and non-surgical extractions, in oral maxillofacial surgery (OMFS) for second year pre-clinical dental students. Our research question is, does a higher level of fidelity and authenticity of the role-play simulation result in better learningoutcomes than the lower levels of the web-based simulation? We compared two role-play simulations (Role Play Sim) to two web-based simulations (Web Sim) on two 50 item multiplechoice tests across two topics covered in separate semesters. 109 second-year students (out of 365 students registered in the course) consented to participate in the Fall study on local anesthesia and 112 consented to participate in the Spring study on non-surgical extractions. In both semesters, participants were randomly assigned to two groups, Web Sim and Role Play Sim. For combined tests on both topics, ANOVA results showed statistically significant difference in mean test scores, $F(1, 217) = 242.59$, $p < 0.001$ for the Role Play Sim but not statistically significant for the Web Sim, $F(1, 217) = 0.228$, $p = 0.633$. 52.8% of the variance in the dependentvariable can be attributed to the role-play simulation while less than .01% of the variance can be attributed to the web-based simulation. The interaction term was not statistically significant. Results suggest that different types of simulations do impact learning differently. The role-playsimulations raised the difficulty and fidelity level to a higher degree than the web-based patientand thus substantially impacted learning on tests.

Session G 6

24 August 2021 09:00 - 10:00

Session Room 9

Single Paper

Teaching and Teacher Education

Assessment in Teacher Professional Development

Keywords: Assessment Methods and Tools, Early Childhood Education, In-service Teacher Education, Quantitative Methods, Teacher Professional Development, Technology, Video Analysis

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 11 - Teaching and Teacher Education

Chairperson: Linda Barman, The Royal Institute of Technology (KTH), Sweden

Measuring the quality of teacher professional development sessions - A newly developed tool

Keywords: Assessment Methods and Tools, In-service Teacher Education, Teacher Professional Development, Video Analysis

Presenting Author:Daniela Rzejak, University of Kassel, Faculty of Human Sciences, Department of Educational Science, Germany; **Co-Author:**Lena Finger, Ruhr University Bochum, Germany; **Co-Author:**Alexander Groeschner, Friedrich Schiller University Jena, Germany; **Co-Author:**Richard Klöden, Vocational School Center for Technology I - Industrial School Chemnitz, Germany; **Co-Author:**Frank Lipowsky, University of Kassel, Germany; **Co-Author:**Dirk Richter, University of Potsdam, Germany

Teacher professional development programs are an integral part for maintaining and expanding teacher competencies. The purpose of the study was to develop a valid and reliable instrument to assess the quality of teacher professional development sessions. In this presentation, we describe the framework for the assessment tool and first results of two studies. In a paper-pencil-based format the instrument was used in two different teacher development programs (sample 1: 84 teachers, sample 2: 52 teachers) to measure the quality perceived by the participants. Results show that the questionnaire is a reliable instrument to assess the quality of teacher professional development sessions. Next steps in the development process are discussed.

Using video to assess preschool teachers' knowledge of oral language pedagogy

Keywords: Assessment Methods and Tools, Early Childhood Education, Teacher Professional Development, Video Analysis

Presenting Author:Sandra Mathers, University of Oxford, United Kingdom

Theory suggests that effective real-time decision-making in classrooms requires teachers to have flexible access to rich and well-organised knowledge of effective teaching practices. Yet prior research on the role and importance of procedural knowledge has been equivocal. This exploratory study used a new video measure of procedural knowledge to examine relationships with observed classroom quality, and establish which opportunities to learn (qualifications, professional development, classroom experience) predict greater knowledge. It focused on preschool teachers' knowledge of oral language pedagogy, on the basis that early language provides the foundation for children's later learning. The sample comprised 104 teachers participating in a wider RCT, designed to evaluate a professional development intervention. Teachers were shown two short videos of classroom interactions and asked to identify instances of effective practice. Responses were coded to capture three facets: *perceiving* (the ability to identify salient language-supporting strategies); *naming* (the use of specific professional vocabulary to describe interactions); and *interpreting* (the ability to interpret the interactions observed). The three facets could be empirically distinguished. Explicit and higher-order procedural knowledge (*naming, interpreting*) most strongly predicted classroom quality. Formal learning opportunities were stronger predictors of procedural knowledge than classroom experience. Intervention effects on classroom quality were mediated by knowledge. Implications for workforce development are discussed.

Investigating the validity of self-report measures that assess teacher technology-related knowledge

Keywords: Assessment Methods and Tools, Quantitative Methods, Teacher Professional Development, Technology

Presenting Author:Franziska Baier, Goethe-Universität Frankfurt, Germany; **Co-Author:**Lukas Schulze-vorberg, Goethe-University Frankfurt, Institute of Psychology, Germany; **Co-Author:**Mareike Kunter, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Holger Horz, Goethe-University Frankfurt, Institute of Psychology, Germany

Subject-independent knowledge about how digital media enhance learning and instruction is an important aspect of teachers' professional knowledge. This knowledge is known as technological pedagogical knowledge (TPK). Self-report measures are widely employed to assess teachers' TPK. However, the validity of these self-report scales have repeatedly been criticized. Only recently have more objective instruments been developed to assess TPK. These performance-based instruments make it possible to study the convergent and discriminant validity of self-report scales and to identify potential method effects. We used a multitrait-multimethod (MTMM) approach to investigate the convergent and discriminant validity of a widely used scale to assess TPK, the self-report scale by Schmidt et al. (2009). In a sample of 238 in-service teachers, we assessed TPK by means of the self-report scale and by means of an objective and validated 7-items test. To investigate discriminant validity, we assessed a second (related but yet distinct) construct, namely teachers' knowledge about how to solve technical problems in the classroom (TPSC) also by means of a self-report scale and a validated 11-items test. The results of a Correlated Trait-Correlated Method minus One (CTC-M-1) Model showed low convergent and discriminant validity of the self-report and a method-effect. The method-specificity was higher for TPSC than for TPK. These results have important implications for the assessment and interpretation of TPK in future evaluation studies.

Session G 7

24 August 2021 09:00 - 10:00

Session Room 3

Single Paper

Educational Policy and Systems

Educational Policy

Keywords: Achievement, Assessment Methods and Tools, Comparative Studies, Educational Attainment, Educational Policy, School Effectiveness, Secondary

Data Analysis

Interest group: SIG 18 - Educational Effectiveness and Improvement, SIG 23 - Educational Evaluation, Accountability and School Improvement (merged with SIG 18)

Chairperson: Katharina Schnitzler, Technical University of Munich, Germany

Measuring equity across the Nordics. Methodological choices as implications for educational policies

Keywords: Assessment Methods and Tools, Comparative Studies, Educational Policy, Secondary Data Analysis

Presenting Author: Oleksandra Mittal, ILS, University of Oslo, Norway; **Co-Author:** Trude Nilsen, University of Oslo, Norway

It has become common that with every cycle of international large-scale student assessments (ILSAs), countries-participants are ranked with regards not only to academic outcomes, but equitability of their education systems. Nordic countries have been the centre of attention for being at the top of equity rankings over most of the ILSA cycles. Nevertheless, a decline in educational equity has been reported lately. However, the process that leads to specific inferences on equity partly stays obscure to education decision-makers. Thus, the present study aims to discuss and empirically illustrate that rankings on "equity league tables" represent more of a "broad-brush picture", as they are sensitive to the choices made by a researcher throughout the process of empirical inquiry. We used data from the international large-scale study TIMSS 2015 to investigate how the equity rankings of the Nordic education systems change in accordance with(1) operationalization and measurement of the socio-economic status (SES),(2) levels of analysis,(3) subject domains,(4) students' grade level,(5) distribution of achievement scores,(5) achievement gaps between high and low-SES students. We used structural equation modeling to analyze data for Denmark, Finland, Norway and Sweden (fourth grade), and Norway and Sweden (eighth grade). To check the comparability of SES across the countries, we did measurement invariance analysis. The results confirm that analytical and methodological choices have a direct impact on the inferences on equity. Hence, we would encourage to report elaborately on the research process and its limitations as it may lead to wrong interpretations and, consequently, policy implications.

Effects of inspections on schools in challenging circumstances: a systematic literature review

Keywords: Achievement, Educational Attainment, Educational Policy, School Effectiveness

Presenting Author: Bernardita Munoz Chereau, University College London, United Kingdom; **Co-Author:** Melanie Ehren, VU university of Amsterdam, Netherlands; **Co-Author:** Jo Hutchinson, Education Policy Institute, United Kingdom

This paper reports a Systematic Literature Review oriented to interrogate the international research evidence on school failure and inspection in high-stakes accountability systems. We included studies in the field of School improvement and educational effectiveness, and (Post)critical sociological views that draw on critical and post-structuralists thinking to describe how education (re)produces inequalities. Our review included scientific papers indexed in ERIC, British Education Index, Scopus and Psycinfo between January 2010 and January 2020. From 269 articles potentially eligible, 118 articles were excluded, and 40 duplicates were removed. After assessing the eligibility of the remaining 118 articles, 54 were excluded with reasons. This paper draws on 46 articles addressing our research question. Findings regarding the effects of high-stakes accountability and inspection, particularly in failing schools -drawing from the school effectiveness and improvement field, as well as from the (post)critical sociological theoretical approaches- are included. Though every high-stakes accountability system is expected to produce winners and losers, the knowledge base of low-performing schools is limited and points to the need to analyse school trajectories to distinguish those that improve over time, from those that do not. Whilst inspection in high-stake accountability systems catalyses virtuous cycles towards improvements in most failing schools, it also propels vicious cycles causing deterioration in a minority of those schools. Given that these vicious cycles are often found in schools facing extremely challenging social circumstances, our findings raise concerns on the fairness of high stakes inspections and consequences for equity and social justice.

The 'losers' of the accountability game: 'failing' schools in England, USA and Chile

Keywords: Achievement, Comparative Studies, Educational Policy, School Effectiveness

Presenting Author: Bernardita Munoz Chereau, University College London, United Kingdom; **Co-Author:** Alvaro Gonzalez, Universidad Católica Silva Henríquez, Chile; **Co-Author:** Coby Meyers, Virginia University, United States

Performance-based accountability systems that rank schools based on their effectiveness produce 'winners' and 'losers'. Substantial evidence has pointed to the (side)effects of these classifications, particularly in the most disadvantaged communities. Whilst previous studies have compared schools under different effectiveness categories within and between countries, this qualitative study takes a cross-case comparison approach to analyse education policies, grey literature and previous research evidence to explore the mechanisms that construct 'failing' schools in three notable high-stakes accountability systems worldwide: Chile, the USA and England. After describing (1) the identification and classification of 'failing' schools; (2) the instruments used to justify these classifications; and (3) who make these judgements, we conclude that the construction of 'failing' schools serves the competition and differentiation required for maintaining neoliberal hierarchical and unequal market-oriented regimes. Instead of disciplining only 'failing' schools, these labels also provide a caution for the whole school system.

Session G 8

24 August 2021 09:00 - 10:00

Session Room 14

Single Paper

Culture, Morality, Religion and Education, Teaching and Teacher Education

Social Interaction in Teacher Professional Development

Keywords: Cooperative/Collaborative Learning, Emotion and Affect, Morality, Secondary Education, Social Aspects of Learning and Teaching, Social Interaction, Teacher Professional Development

Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education, SIG 13 - Moral and Democratic Education

Chairperson: Beat Rechsteiner, University of Zurich, Switzerland

Stories about Pedagogical Emotions in professional development contexts

Keywords: Cooperative/Collaborative Learning, Emotion and Affect, Social Interaction, Teacher Professional Development

Presenting Author: Karin Sarfati shaulov, Ben Gurion University of the Negev, Israel; **Co-Author:** Dana Vedder-Weiss, Ben-Gurion University of the Negev, Israel

While research extensively addresses the impact of professional development (PD) on teachers and teaching, teachers' emotions in PD are seldom studied. This study examines teachers' emotional stories in PD contexts: "small stories" in which teachers explicitly express their pedagogical emotions. We characterize these stories and explore their implications for teacher collaborative learning. The study is part of an Israeli intervention program aiming to foster problem-based professional discourse in school-based teacher communities. In an analysis of 66 audio-recorded teacher communities' meetings, we identified 128 emotional stories and 492 emotional expressions in these stories. We analyzed the elicitation of the story itself, the object and type of emotion expressed, and colleagues' response to the story. On average, teachers' emotional stories amounted to only 4% of meeting time, and 40% of the emotional expressions arose in stories explicitly elicited by the facilitator; thus, even in a program focused on problems-of-practice, teachers rarely spontaneously expressed emotions in stories. We found that teachers shared more negative than positive emotions (60% versus 40%), and more than 50% of the stories, especially those expressing negative emotions, received significant response from colleagues. We suggest that teachers' emotional stories and the interest they trigger in learning communities provide an opportunity to discuss emotional teaching challenges. However, we also suggest that this opportunity rarely materializes given our finding that teachers did not develop inquiry discussions around the shared emotions. Further research is therefore needed to examine ways to leverage emotional stories to advance professional collaborative learning.

Objective decision-making: Teacher allocation meetings' structure and interaction

Keywords: Secondary Education, Social Aspects of Learning and Teaching, Social Interaction, Teacher Professional Development

Presenting Author: Janneke Sleenhof, Eindhoven School of Education, Netherlands

This study focuses on teachers' group-decision making during allocation meetings. A previous interview study showed that teachers question the objectivity and fairness of sorting decisions due to negative interaction experiences and a lack of structure during these meetings. To characterize the structure and interaction of these meetings, 33 student discussions were observed. Results showed a variety of structures and interactions, including differences in the degree to which the meetings met criteria relevant to achieving objective allocation decisions. It can be concluded that - based on the criteria of acceptance, fairness, and transparency as used in this study - allocation meetings need to be well-prepared and substantiated, to allow for every teacher's opinion to be heard, and follow a procedure that is clear to everyone. In view of students' future school careers, it is important to pay close attention to functional interaction and structured discussions that ensure transparent, acceptable and fair decision-making.

Beyond attitudes and teaching methods: The role of teacher professional ethos in tackling bullying

Keywords: Morality, Social Aspects of Learning and Teaching, Social Interaction, Teacher Professional Development

Presenting Author: Eveline Gutzwiller-Helfenfinger, University of Fribourg, Switzerland

Bullying is a targeted, systematic and repetitive abuse of power and increasingly seen as immoral. It has a negative impact on the social and learning climate in classrooms, impedes classroom management, has grave psychosocial, health, and academic consequences for bullies, victims, and witnesses, and impairs students' academic achievement. In the school and classroom context, recent research has identified the critical role of adults, especially teachers. Their perceptions, attitudes, beliefs, and behaviours contribute to the establishment and chronicification of bullying. When not participating in any anti-bullying program, teachers show different reactions when facing bullying. Some intervene, and in different ways, while others do not intervene at all. Given teachers' educational role and the moral and ethical basis of their professional teaching practice, it is most likely that the reactions they show in cases of bullying will directly impact student's behavior, as they send direct and indirect messages on the acceptability of bullying through their own behaviour. Accordingly, teachers' sensitivity towards, awareness of, and reactions to bullying can be linked to their professional ethos, understood, very basically, as relating to care and responsibility. Teachers' professional ethos in the area of school bullying is reconstructed from a bottom-up perspective, starting with the phenomenon of school bullying, its specific characteristics and some selected findings, also regarding effective prevention and intervention. These points are linked back to a multidimensional model of teacher professional ethos which moves beyond moral and ethical considerations and addresses the role of the professional context in nourishing and sustaining such ethos.

Session G 9

24 August 2021 09:00 - 10:00

Session Room 2

Single Paper

Educational Policy and Systems, Learning and Instructional Technology, Motivational, Social and Affective Processes

School Effectiveness

Keywords: Educational Policy, Educational Technology, Emotion and Affect, Parental Involvement in Learning, Quantitative Methods, School Effectiveness, Secondary Data Analysis, Vocational Education

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 08 - Motivation and Emotion, SIG 23 - Educational Evaluation, Accountability and School Improvement (merged with SIG 18)

Chairperson: Chang Lu, University of Alberta, Canada

Why do some students feel well at school and others do not? A discriminant analysis

Keywords: Emotion and Affect, Parental Involvement in Learning, Quantitative Methods, School Effectiveness

Presenting Author: Ramona Obermeier, Johannes Kepler Universität Linz, Austria; **Co-Author:** Michaela Gläser-Zikuda, University of Erlangen-Nuremberg, Germany; **Co-Author:** Juliane Schlesier, University of Oldenburg, Germany

The relevance of well-being at school for students' self-regulated learning, academic success, social interaction, and health was neglected for a long time. Meanwhile, there is a growing number of studies focusing on individual and school related predictors of students' well-being. However little is known about (1) the relevance of familial determinants and (2) their mutual impact with scholastic determinants on well-being at school. Therefore, this study aims to classify students with extreme high or low well-being at school using their perceptions of the scholastic and familial environment. In total, $N = 852$ fifth graders ($N = 664$ (78.7%) girls; average age: $M = 10.19$, $SD = 0.44$) from two types of secondary schools in Germany participated in a survey based on standardized questionnaires. Multivariate analysis of variance (MANOVA) and a discriminant analysis were calculated to explore the mutual impact of scholastic and familial influence on students' well-being at school. Results of the discriminant analysis show that educational track, classroom-management, classroom climate, and instructional clarity, as well as parental performance pressure are characteristics that allow to separate students with an extreme high or low level of scholastic well-being. Hence, those variables are not only applicable to predict students' well-being at school but also to classify students without knowing their current well-being. Further results of the study will be presented, and implications for social relations in school and for instructional quality, as well as for parental school related behaviour will be discussed.

Digital Transformation in Vocational Education from the Perspectives of School Management & Teachers

Keywords: Educational Technology, Quantitative Methods, School Effectiveness, Vocational Education

Presenting Author: Martina Rauseo, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:** Andreas Harder, University of Konstanz, Germany; **Co-Author:** Deborah Glassey, HES-SO Valais-Wallis, Switzerland; **Co-Author:** Chiara Antonietti, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:** Francesca Amenduni, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:** Alberto Cattaneo, Swiss Federal Institute for Vocational Education and Training, Switzerland; **Co-Author:** Serge Imboden, HES-SO Valais-Wallis, Switzerland; **Co-Author:** Stephan Schumann, University of Constance, Germany

The ongoing Corona crisis has highlighted the importance of digital transformation in educational organisations. The effects of the digital transformation are not limited to the classroom level but extend into various areas of the school (e.g., leadership and strategy, staff development, and school culture). Against this background, we have investigated the current state of digital transformation in Swiss vocational schools from the perspective of both school management and teachers. For this endeavor, two surveys were respectively conducted in the period from November 2019 to September 2020. While the first survey ($n=581$) primarily dealt with the topic of leadership, the second survey ($n=2.432$) focused on the digital competencies of teachers. However, a battery of identical items was used in both questionnaires to compare the responses between groups. Potential group differences were examined using t-tests. The results show significant differences between school management and teachers in variables from several content dimensions of digital transformation, including satisfaction with digital strategy ($p< 0.001$; $d=0.464$) and with IT support ($p< 0.001$; $d=0.225$), teachers' digital competencies ($p< 0.001$; $d=0.782$), and attitude towards digital teaching-and-learning methods ($p< 0.001$; $d=0.626$). This suggests that the perspectives of both school management and teachers should be considered in order to successfully shape the digital transformation.

Data rich and information poor? Improving instruction with multiple data.

Keywords: Educational Policy, Quantitative Methods, School Effectiveness, Secondary Data Analysis

Presenting Author: Sebastian Wurster, Johannes Gutenberg University Mainz, Germany

Data-informed decision making plays a key role for school improvement and improvement of instruction. In most European countries different data sources like school self-evaluations or student achievement data are provided as a basis to improve instruction. Data-informed improvement of instruction is a challenge and an important issue arising from the diversity of data sources is discussed as the Data Rich Information Poor Syndrome. Data itself is not sufficient to initiate

improvement measures and too much data might cause an "overload" hindering appropriate data use. On the other hand, multiple data provide a broader and more reliable information base and prevent a possible narrowing of data informed decisions caused by the specific focus of single data sources. The study analyses teachers' use of self-evaluation, state-wide comparison tests and centralized examinations data to improve instruction. Based on a large-scale-assessment data set regularized partial correlation networks were applied. The results show that a substantial number of teachers use data to improve instruction, but especially in single domains. Furthermore, multiple data is used simultaneously for improving instruction, primarily the combination of different sources of student achievement data. Simultaneous use in combination with self-evaluation data is less frequent.

Session G 10

24 August 2021 09:00 - 10:00

Session Room 13

Single Paper

Motivational, Social and Affective Processes, Teaching and Teacher Education

Motivation, Emotion and Mathematics

Keywords: Attitudes and Beliefs, Higher Education, Mathematics, Motivation and Emotion, Out-of-School Learning, School Effectiveness

Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education

Chairperson: Sabine Schlag, University of Wuppertal, Germany

Does school affect private tutoring attendance? Predictors of private tutoring among tenth-graders

Keywords: Mathematics, Motivation and Emotion, Out-of-School Learning, School Effectiveness

Presenting Author: Anna Hawrot, Leibniz Institute for Educational Trajectories (LIfBi), Germany

Private tutoring is a part of everyday life for hundreds of thousands of students all around the world and its prevalence is growing. However, despite a proliferation of research on drivers and outcomes of private tutoring, still little is known about the role that school plays in the decision to take private tutoring. This study uses two German nationwide samples of grade 10 students (over 14,000 participants in total) to inquire into school-related factors that may affect private tutoring attendance in maths and German. These factors are: teacher support in the classroom, classroom management, teacher collaboration with the teacher body, and teacher-family communication. We also verified the role of various individual factors, including student helplessness in maths and German, and subjective task values that students hold. Two-level logistic regression analyses did not confirm that school-related factors contribute to the decision on taking private tutoring. However, private tutoring attendance was affected by student helplessness, subjective task values, past school achievement, cognitive ability, gender, mother tongue, and type of school attended, although the pattern of results differed between subjects. The results highlight the role of subject-specific motivational factors behind the decision to take private tutoring as well as the remedial role of private tutoring. They also show that school contribution to the decision remains elusive, at least for maths and German.

Relation between facets of self-concept and study satisfaction in university mathematics programs

Keywords: Attitudes and Beliefs, Higher Education, Mathematics, Motivation and Emotion

Presenting Author: Stefan Ufer, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:** Timo Kosiol, Ludwig-Maximilians-Universität (LMU), Germany;

Co-Author: Stefanie Rach, Otto-von-Guericke-Universität Magdeburg, Germany

Mathematical self-concept as the individual perception of abilities is an important factor in university learning processes. At the transition into a mathematics study program, the domain mathematics changes from mostly informal school mathematics to a more formal form of university mathematics. In this submission, we present a three-dimensional model of mathematical self-concept, which differentiates between a general, a school-based and a university-based mathematical self-concept. Based on a study with 202 students (in a bachelor or teacher education program), we generate evidence for the quality of this new questionnaire to measure three different self-concept facets. These differentiated scales allow us to specify the relation between mathematical self-concept and study satisfaction: Whereas school-based self-concept doesn't predict study satisfaction in the middle of the first semester, general and university-based self-concept positively do. We discuss implications of the differentiated measures of mathematical self-concept.

Session G 11

24 August 2021 09:00 - 10:00

Session Room 11

Single Paper

Cognitive Science, Learning and Social Interaction

Foreign and Second Language Acquisition

Keywords: Cognitive Skills, Developmental Processes, Language (Foreign and Second), Literacy, Neuroscience, Quantitative Methods, Second Language Acquisition

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 22 - Neuroscience and Education

Chairperson: Guido Nottbusch, University of Potsdam, Germany

Predictors for Code-Switching Behavior in Dual Language Learning Children

Keywords: Developmental Processes, Language (Foreign and Second), Quantitative Methods, Second Language Acquisition

Presenting Author: Leila Teresa Schächinger Tenés, Faculty of Psychology, University of Basel, Switzerland; **Co-Author:** Jessica Carolyn Bühlér, University of Basel, Switzerland; **Co-Author:** Letizia Volpin, University of Neuchâtel, Switzerland; **Co-Author:** Alexander Grob, University of Basel, Switzerland; **Co-Author:** Katrin Skoruppa, University of Neuchâtel, Switzerland; **Co-Author:** Robin Klaus Segerer, University of Basel, Switzerland

Dual language learning children are thought to engage in language switches, so called code-switching driven by compensatory (i.e., lexical gaps), preferential (i.e., language preference), or compositional (i.e., actively create conversation) purposes. Over time, children's compensatory code-switching is assumed to decrease, while compositional code-switching increases. However, the relative effect of age and language competence is not yet fully understood. In the here presented study, incremental effects of different language competence facets on code-switching purpose and direction and how such potential effects are moderated by age is investigated cross-sectionally. Data of 52 children ($n = 29$ boys) aged 32 to 78 months ($M = 50.54$, $SD = 8.42$) who speak the societal language German or French, as well as the home language Italian or Turkish were collected in Switzerland and Germany. Children's language competence was assessed in their societal and home language. Child-specific code-switching behavior was inquired via parental questionnaire. The results of linear mixed modelling revealed no specific effects of age or language competence on code-switching purpose. However, when code-switching from the home to the societal language, children's code-switching seemed to be influenced both by weak home as well as strong societal language competences. This pattern was not observed for code-switching from the societal to the home language. These findings underline the various ways in which children's linguistic competences influence code-switching. They indicate that code-switching should not only be interpreted as a lack of competence even in very young children, especially in the case of code-switching into the social language.

Preschool brain- & behavioral data predict literacy outcomes in German (dialect)-speaking children

Keywords: Developmental Processes, Language (Foreign and Second), Literacy, Neuroscience

Presenting Author: Jessica Carolyn Bühlér, University of Basel, Switzerland; **Co-Author:** Urs Maurer, The Chinese University of Hong Kong, Hong Kong

When children learn to read, they map visual symbols to spoken language units. This mapping process may be impaired in children who speak dialect due to a linguistic mismatch at various linguistic levels. Results are summarized from a longitudinal study on behavioral and neural mechanisms underlying reading

acquisition in German-speaking Switzerland, where dialect use is not confounded by low SES. At the behavioral level, structural equation modeling (SEM) revealed a negative impact of Swiss-German dialect on Grade 1 reading and spelling outcomes and a positive effect on pre-school literacy-related skills. Yet Swiss-German speaking children did not differ from standard German speaking children in reading and spelling skills, suggesting that literacy-related skills may compensate for the disadvantage of a linguistic mismatch. At the neural level via electroencephalography, dialect-related vocabulary mismatch with pictures was reflected by N400 and LPC effects, while phoneme mismatch was only reflected by an LPC effect suggesting that phoneme mismatch does not impede semantic processing in dialect use. SEM models incorporating preschool neural mismatch measures and (pre-)school-aged behavioral data revealed that dialect-specific N400 effects were negatively associated with preschool literacy related skills and language-general N400 effects were positively associated with later reading suggesting the feasibility of using neural measures to predict literacy acquisition in children speaking dialect, especially in the German language context.

Effects of receptive-level phonological processing in mono- and bilingual preschoolers

Keywords: Cognitive Skills, Language (Foreign and Second), Quantitative Methods, Second Language Acquisition

Presenting Author:Jessica Carolyn Bühl, University of Basel, Switzerland; **Co-Author:**Leila Teresa Schächinger Tenés, Faculty of Psychology, University of Basel, Switzerland; **Co-Author:**Katrin Skoruppa, University of Neuchâtel, Switzerland; **Co-Author:**Alexander Grob, University of Basel, Switzerland; **Co-Author:**Robin Klaus Segerer, University of Basel, Switzerland

Little research exists that examines typical phonological development in preschool-aged bilinguals and/or dual language learners (DLLs), and even less pertains to typical *receptive* phonological skill development when two languages and phonologies come into play. The here presented study examined (1) whether monolingual German or French speaking preschoolers and same-aged DLL children, who additionally spoke either Italian or Turkish (i.e., their spoken home-language HLA), differed in receptive-level phonological processing thus focusing on person-based factors. (2) We investigated whether specific aspects of phonological processing pertaining to properties of linguistic markedness and/or structure (i.e., stimulus-based factors) facilitated receptive-level phonological processing similarly (or differently) in monolingual (aka SLL) and DLL children. A total of $N = 174$ mono- and bilingual children aged 3 to 5 years was examined ($M_{Age} = 50.11$ months, $SD = 7.61$ months; range = 32 to 78 months). Data was analyzed using generalized logistic linear mixed modelling (GLMM) for person- and stimulus-based factors and examined receptive-level phonological processing for (1) societal language (SLA) over all children, and (2) with a focus on DLL children only, hereby combining SLA+HLA phonological processing abilities. GLMM analysis revealed significantly weaker phonological processing accuracy in DLL vs. SLL children in the SLA, even after accounting for age and SES. Furthermore, for SLA, several stimulus-based factors significantly impacted phonological processing for SLL and DLLs. Yet in the DLL-only examination for stimulus-based factors regarding successful SLA+HLA phonological processing fewer predictiveness instances could be determined, likely indicating that phonological processing might still be less specialized in DLL children.

Session G 12

24 August 2021 09:00 - 10:00

Session Room 16

Single Paper

Assessment and Evaluation, Higher Education

Assessment Methods and Tools in Higher Education

Keywords: Assessment Methods and Tools, Higher Education, Interdisciplinary, Learning Disabilities, Motivation, Qualitative Methods

Interest group:SIG 01 - Assessment and Evaluation

Chairperson: Joanna Tai, Deakin University, Australia

FACTORS INFLUENCING STUDENT ENGAGEMENT IN HIGHER EDUCATION CONTEXT

Keywords: Assessment Methods and Tools, Higher Education, Motivation, Qualitative Methods

Presenting Author:Huy Cuong Nguyen, University of Szeged, Viet Nam

The concept of "Student engagement" in learning has been receiving a lot of attention worldwide because it is considered as an important factor affecting the academic success of students, and it also has a significant role in assessing and improving the quality of education. Student engagement has a multi-dimensional nature including the cognitive, behavioural, affective, and agentic engagement, which have been described and empirically validated. The aims of this research was to assess and outline major factors that influence student engagement in the higher education context. For the research, a case study has been carried out, which sought to analyse the students' learning experience as a valuable source of data. A combination of quantitative and qualitative methods of data collection was applied during the research. The collected data from the survey and focus-group interview allowed classifying the factors influencing the levels of student engagement among the research participants into five major groups: 1) communication, collaboration, active involvement into learning activities, and enriching educational experiences; 2) interactions between students, and between students and academic staffs; 3) levels of academic challenge; 4) supporting classroom and school environment; and 5) supporting family environment. These groups together unite factors that were found to influence the most on students' willingness to participate and involve in learning activities, and on students' perception of the significance of training and education, as well as on the desire of students to succeed academically. **Keywords:** student engagement; behavioural engagement; emotional engagement; cognitive engagement; agentic engagement; school environment; family environment

Design guidelines for the assessment of interprofessional competencies in healthcare education.

Keywords: Assessment Methods and Tools, Higher Education, Interdisciplinary, Qualitative Methods

Presenting Author:Hester Smeets, Zuyd University of Applied Sciences & Maastricht University, Netherlands; **Co-Author:**Albine Moser, Zuyd University of Applied Sciences, Netherlands; **Co-Author:**Dominique Sluijsmans, Maastricht University, Netherlands; **Co-Author:**Jeroen Van Merriënboer, Maastricht University, Netherlands

Future healthcare demands professionals who are educated in an interprofessional (IP) context. Well-designed IP assessments are needed to determine that students have developed these IP competencies. At the moment, evidence-informed guidelines are missing for the design of IP assessments. The aim of this study is to develop guidelines for the assessment of IP competencies in healthcare education. A qualitative consensus study design was conducted to reach consensus about guidelines for the design of an IP assessment, using the nominal group technique. A total of 26 design guidelines were agreed on in three areas: IP assessment task, IP assessors, and IP assessment procedure. We recommend that future research focuses on gaining insights into the design principles for the implementation of these guidelines in higher education.

What are students' experiences of assessment adjustments? Moving towards inclusive assessment design

Keywords: Assessment Methods and Tools, Higher Education, Learning Disabilities, Qualitative Methods

Presenting Author:Joanna Tai, Deakin University, Australia; **Co-Author:**Mary Dracup, Deakin University, Australia; **Co-Author:**Merrin McCracken, Deakin University, Australia

All students must be provided with equivalent opportunities to demonstrate academic achievement: this is a moral obligation and in many countries, a legal requirement. Assessment adjustments are commonly used to this end, but not all students who might qualify take them up, nor might they adequately address some students' needs. An alternative focus on inclusive assessment design may provide some solutions, and also ensure a wider range of diverse needs are accounted for. This paper explores students' experiences of assessment adjustments to identify how inclusive assessment might be designed, through an analysis of 2860 records from an assessment adjustment database, and a qualitative survey of 38 students. Time extensions were the most common adjustment. Students identified aspects of assessment design that contributed to an inclusive experience, including choice of topic and format. A move towards inclusive assessment design is important for the diverse range of students we welcome into higher education.

Session G 13

24 August 2021 09:00 - 10:00

Session Room 18

Workshop

Higher Education

How to enhance university students' well-being and resilience: an educational escaperoom.

Keywords: Achievement, Educational Psychology, Higher Education, Motivation and Emotion

Interest group:

International research has shown that university students, compared to peers, show a higher amount of psychological distress, which also has been found to influence academic achievement. At the same time, there is a growing attention to enhancing positive well-being and resilience, as this has been found to be related to outcomes such as motivation and academic achievement, as well as dealing with the challenges and stressors that individuals face. But how can you help students enhance their positive well-being and their resilience? This workshop focuses on helping participants become aware of the importance of resilience and positive well-being. The first part of the workshop consists of an educational escape room, which can be an effective way to gain new knowledge. Participants are challenged to actively process the concepts and theories on well-being, resilience, and resilience strategies, and try to "escape the EARLI conference". The second part consists of working on a case with the newly acquired knowledge. The final part of the workshop concerns a discussion about the transfer of this knowledge to the participants' daily practice. By the end of the workshop, participants will have: (1) Gained more knowledge on positive well-being, psychological resources, resilience and resilience factors, (2) Worked with a specific case to practice supporting students in their resilience/well-being and (3) Examined the opportunities for incorporating resilience factors in their own daily practices.

How to enhance university students' well-being and resilience: an educational escaperoom.

Presenting Author:Marjon Fokkens-Bruinsma, University of Groningen, Netherlands; **Co-Author:**Irene Poort, University of Groningen, Netherlands; **Co-Author:**Lisa Kiltz, University of Groningen, Netherlands; **Co-Author:**Ellen Jansen, University of Groningen, Netherlands

International research has shown that university students, compared to peers, show a higher amount of psychological distress, which also has been found to influence academic achievement. At the same time, there is a growing attention to enhancing positive well-being and resilience, as this has been found to be related to outcomes such as motivation and academic achievement, as well as dealing with the challenges and stressors that individuals face. But how can you help students enhance their positive well-being and their resilience? This workshop focuses on helping participants become aware of the importance of resilience and positive well-being. The first part of the workshop consists of an educational escape room, which can be an effective way to gain new knowledge. Participants are challenged to actively process the concepts and theories on well-being, resilience, and resilience strategies, and try to "escape the EARLI conference". The second part consists of working on a case with the newly acquired knowledge. The final part of the workshop concerns a discussion about the transfer of this knowledge to the participants' daily practice. By the end of the workshop, participants will have: (1) Gained more knowledge on positive well-being, psychological resources, resilience and resilience factors, (2) Worked with a specific case to practice supporting students in their resilience/well-being and (3) Examined the opportunities for incorporating resilience factors in their own daily practices.

Session G 14

24 August 2021 09:00 - 10:00

Session Room 5

Espresso Invited Symposium

Lifelong Learning, Teaching and Teacher Education

SIG 3: Teacher Learning and Professional Development from a Conceptual Change Perspective

Keywords: Attitudes and Beliefs, Conceptual Change, Higher Education, Learning Approaches, Lifelong Learning, Misconceptions, Pre-service Teacher Education, Professions and Applied Sciences, Self-regulation, Teacher Professional Development

Interest group: SIG 03 - Conceptual Change

Chairperson: Gertraud Benke, Klagenfurt University, Austria

Organiser: Stella Vosniadou, Flinders University, Australia

Discussant: Erno Lehtinen, University of Turku, Finland

This symposium intends to open a discussion on teacher cognition and conceptual change. Historically, studies on conceptual change have been focused on students' learning of concepts that have been shown to be hard. In the last thirty years, several theories modelling why learning target concepts might be difficult have been developed, as well as strategies to address the found challenges. Less attention has been given to the beliefs of teachers and their concepts of their subjects and about learning. While these are important topics in research on teacher education and professional development, research communities focusing on teacher education generally do not approach these topics from a specifically conceptual change theory point of view. In this symposium, we will discuss three papers looking at beliefs and concepts of teachers and student teachers about their professional practices, identify and analyse misconceptions and propose steps to address them from conceptual change theory perspectives.

Teachers' Misconceptions About Learning Strategies: Analyses and Interventions

Presenting Author:Alexander Renkl, University of Freiburg, Germany; **Co-Author:**Inga Gloger-Frey, University of Freiburg, Germany

An important goal of instruction is to foster students' learning strategies. However, many teachers have deficits in this respect. One reason for such deficits may be that teachers do not have sufficient knowledge about learning strategies or even hold misconceptions. In a series of studies, we analyzed to which extent (pre-service) teachers hold misconceptions, and how possible misconceptions can be addressed. We found that teachers have fragmented and in part misconceived knowledge in the sense that they miscategorize, for example, teaching or problem-solving strategies as learning strategies. Such knowledge deficits can be successfully addressed by a training intervention providing a general categorical framework that helps to categorize only learning strategies as such. This intervention could be optimized by training if-then rules when deciding whether something is a learning strategy or not. Overall, we have developed an effective kick-off intervention that, however, should be expanded in further research.

Conceptual change for and during working life; the medical domain

Presenting Author:Els Boshuizen, Open University of the Netherlands, Netherlands

Learning formal (bio)medical knowledge builds on and may interfere with informal learning that started at a very young age. This paper presents a literature review covering the range from early childhood to advanced stages of working life. We found: Naïve and false beliefs and perceptions of disease (in primary and secondary school); misconceptions regarding biomedical and systems knowledge (in secondary school and beyond); and beliefs about patients and dealing with them (in medical school and beyond). Grounds for these weaknesses regard factors related to home culture, domain knowledge, teaching materials, and factors inherent to the medical science and profession itself.

A conceptual change perspective on understanding teachers' belief systems

Presenting Author:Stella Vosniadou, Flinders University, Australia

The framework theory approach to conceptual change (Vosniadou, 2013) was used to guide the investigation of pre-service teachers' belief systems about learning and teaching and their influence on their learning strategies and academic performance. The results of three studies validated a Beliefs about Learning and Teaching (BALT questionnaire), which indicated the co-existence of beliefs both consistent and inconsistent with SRL in about 50% of the participants. Structural equation modelling showed that beliefs inconsistent with SRL and especially beliefs in transmissive teaching were negative predictors of the use of cognitive and metacognitive strategies. The use of cognitive and metacognitive strategies was in turn a positive predictor of the pre-service teachers' academic

performance. We argue that the co-existence of consistent and inconsistent with SRL beliefs undermines the use of cognitive and metacognitive strategies in pre-service teachers with negative effects on their academic performance. It is suggested that interventions to support pre-service teachers to promote metacognition and SRL can be more effective if they address their inconsistent with SRL belief systems and especially their beliefs in transmissive teaching.

Session G 15

24 August 2021 09:00 - 10:00

Session Room 15

Invited Symposium

Assessment and Evaluation

SIG 1: Learning by doing won't suffice: What determines the quality of peer feedback?

Keywords: Assessment Methods and Tools, Competencies, Content Analysis, Higher Education, Peer Interaction, Pre-service Teacher Education, Quasi-experimental Research, Social Aspects of Learning and Teaching, Social Interaction, Writing/Literacy

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Liesje Coertjens, Université catholique de Louvain (UCL), Belgium

Organiser: Liesje Coertjens, Université catholique de Louvain (UCL), Belgium

Organiser: Christopher Neil Prilop, Germany

Discussant: Frans Prins, Utrecht University, Netherlands

Feedback has consistently been identified as an important lever for learning, yet in many settings teaching staff lacks the time to provide feedback on a regular basis. In light of this, peer feedback (i.e., students receiving feedback from their peers) has been advanced as a promising alternative. Yet, the degree to which peer feedback is indeed a valuable alternative, hinges upon the quality of such peer feedback. This symposium focuses on the determinants of peer feedback quality. The first contribution, by Prilop et al., convincingly evidences that prior experience with peer feedback does not suffice and can even negatively affect the quality of peer feedback. Peer feedback training is thus needed. The second contribution, by Ocampo et al., broadens our horizon on possible avenues for such training: it provides a systematic overview of beliefs that can impact peer feedback quality. The third contribution, by Aben et al., rigorously examine how the perception of a peer's skill (i.e., the author's language skills) affects the quality of the feedback provided on the peers work (i.e., an argumentative text). Finally, in the fourth contribution, Senden et al. relies on a quasi-experiment to examine the impact of a training focusing on interpersonal factors on the quality of the peer feedback. Implications for practice as well as promising steps for future research will be addressed.

How knowledge, professional vision, and experience predict peer feedback quality

Presenting Author: Christopher Neil Prilop, Leuphana University Lueneburg / University of Hamburg, Germany; **Co-Author:** Kira Elena Weber, Leuphana University Lueneburg, Germany; **Co-Author:** Marc Kleinknecht, Leuphana University Lueneburg, Germany

Peer feedback is crucial for the continuous development of (pre-service) teachers' professional competence. However, expert-novice-comparisons showed that novices' peer feedback lacks substantial quality components such as being specific or incorporating questions. To foster feedback competence effectively, research needs to determine which constituents of pre-service teachers' professional competence (e.g., knowledge, beliefs, professional vision) are related to pre-service teachers' peer feedback quality. Consequently, this study investigated to what extent pre-service teachers' knowledge about classroom management, professional vision of classroom management, teaching experience and peer feedback experience determined the quality of their peer feedback. Pre-service teachers' knowledge, professional vision, teaching experience and peer feedback experience was measured, and they provided written feedback for a video-based classroom management situation. Written feedback was analyzed concerning assessment criteria, specificity, explanations, alternatives, questions, valency, and first-person using an adapted version of the Feedback Quality Index. A multiple regression analysis showed that professional vision of classroom management positively predicted pre-service teachers' peer feedback quality concerning its specificity, while knowledge showed a negative relationship to this component of peer feedback quality. Knowledge positively predicted quality of explanations, while peer feedback experience displayed a negative relationship to this component. No significant relationships were found for teaching experience. The results indicate that pre-service teacher education should focus on promoting pre-service teachers' professional vision, additional to peer feedback training, to increase peer feedback quality.

Systematic review on human and social variables in peer assessment

Presenting Author: Jose Carlos Ocampo, University of Deusto, Spain; **Co-Author:** Maryam Alqassab, Vatel Bahrain International Hospitality School, Germany; **Co-Author:** Javier Fernández, Universidad Autónoma de Madrid, Spain; **Co-Author:** Ernesto Panadero, Universidad Deusto, Spain

Since Van Gennip et al. (2009) proposed that peer assessment (PA) is an interpersonal and interactional process, several assessment scholars have taken interest in this perspective of PA. In his empirical review on this topic, Panadero (2016) identified ten themes on the literature that were subsequently grouped into: (1) intra-individual factors of PA, (2) interpersonal aspects of PA, and (3) cognitive aspects of PA. Since articles that adopted this perspective on PA has increased since that review, a follow up systematic review on articles published after 2016 is imperative. Therefore, the aim of this study is to systematically review human and social variables that affect PA implementation. Three methods of acquiring the pertinent articles for the review were used. First, empirical studies that cited the work of Van Gennip et al. (2009) and Panadero (2016) in Google Scholar were selected. Second, a literature search of key terms related to human and social variables in PA (i.e., PA + 'motivation', 'emotion', 'interpersonal', 'friendship') was conducted in two research databases (i.e., ERIC and PsycINFO). Lastly, a literature search of key terms previously studied with PA (i.e., PA + 'feedback', 'review', 'evaluation', 'grading and anonymity', 'blind', 'confidential') was conducted in the two research databases. The three searches were restricted to articles published after 2014 as the previous years were already covered in the 2016 review. In total, there were 281 studies identified for the review.

The effects of perceived language skills on peer feedback and peer grading in secondary education

Presenting Author: Jochem Aben, University of Groningen, Netherlands; **Co-Author:** Anneke Timmermans, University of Groningen, Netherlands; **Co-Author:** Filitsa Dingyldou, University of Groningen, Netherlands; **Co-Author:** Jan-Willem Strijbos, University of Groningen, Netherlands

Students' peer perceptions affect feedback exchanges. Yet little is known about the relationship between peer assessment of argumentative texts and students' perception of the author's language skills. To study this relationship, 15- and 16-year-old Dutch students ($N = 176$) provided feedback and grades on two texts, while being under the illusion that the texts had been written by two classmates whom the feedback providers perceived as either a peer with stronger or weaker language skills than themselves. In reality, students provided feedback and grades on manipulated texts of the same quality. Feedback provided to perceived stronger peers was not found to differ in amount, length, function, and focus from feedback provided to perceived weaker peers. Simultaneously, students provided higher grades to peers perceived to have stronger language skills than themselves than to peers perceived to have weaker language skills. The study revealed that peer assessment is a complex process affected by peer perceptions, and as such, is not a simple transmission process that is insensitive to who the recipient is or is perceived to be. Future research should investigate why the provided peer feedback may have been unaffected by perceived language skills, whereas text quality is—as it seems—at least partly in the eye of the beholder.

The impact of training targeting the social nature of peer feedback

Presenting Author: Morgane Senden, Université catholique de Louvain (UCL), Belgium; **Co-Author:** Dominique De Jaeger, Université catholique de Louvain (UCL), Belgium; **Co-Author:** Liesje Coertjens, Université catholique de Louvain (UCL), Belgium

Peer feedback is by nature a social process and, if not taken into account, this social nature could harm students' learning or well-being. Indeed, it has been shown that some variables linked to the social nature of peer feedback, like psychological safety or trust, impact students' perceived learning. However, the impact of the social nature of peer feedback is still not well understood. This quasi-experimental study aims to investigate if a training targeting the social nature of peer feedback has a positive impact on students' learning, students' perceptions (regarding psychological safety, trust in the self, trust in others and the importance of anonymity) and the quality of feedback provided by students. Third-year students taking a seminar on the didactic of acrobatic sports took part in an intervention study using a quasi-experiment with pre- and posttest design. The first cohort of students (control group) only received training in providing high-

quality feedback while the second cohort (experimental group) additionally receive training targeting the social nature of peer feedback. Data collection for the control group was finalised, while it is ongoing for the experimental group. Preliminary results indicate no difference in students' perception between the pre- and the posttest for the control group. This suggests that students' perceptions are not altered by simply receiving training on the provision of high-quality feedback and participating in a peer feedback activity. Further analyses will compare the evolution of students' perceptions in the control and experimental groups.

Keynotes I 1

24 August 2021 10:45 - 11:45

Auditorium B

EARLI Keynote Session

Early manifestations of Executive Functions from the end of the first year at the infant school

Keywords: Cognitive Development, Cognitive Skills, Early Childhood Education, Teaching/Instruction

Interest group:

Chairperson: Eleftheria Gonida, Aristotle University of Thessaloniki, Greece

Over the past decades the interest in the development of executive functions (EFs) has increased. Following Luria, subjects do not react passively to arriving information, but create intentions, form plans of their action, control their execution and regulate their behavior by comparing the effects of these actions with their original intentions. We know that the first two years are critical concerning the first manifestations of cognitive control (Diamond, 2006), nevertheless, little is known about the origins of EFs in infancy and its early forms of development (Marcovitch & Zelazo, 2009). Various traditions in psychology place language in a hegemonic position (i) the tests are communicated verbally to the subjects. The experimenter says what should be done, when and how. (ii) Implicit or explicitly language is considered the *first/the* instrument of cognitive control. Recently, researchers claim that to study the first manifestations of EFs, language should be left in the background and self-directed gestures and action should be seriously considered (Basilio & Rodríguez, 2017). The ecological validity of standardized tests is been questioned. Significant challenges that the children set in everyday life should be analyzed, rather than the challenges set by the experimenter (Barker & Munakata, 2015), what those challenges consist of and what children do to resolve them (Moro, 2012; Whitebread & Basilio, 2012). In our research group we focus on the following questions: do children set their *own challenges* (goals) from the *end of the first year* of life in everyday situations in classroom 0 – 1? What goals and means consist of and how their semiotic complexity develop? What is the status of *action* with materiality (objects / instruments) and *gestures* in these processes? What is the role of the teacher in this important developmental achievement? (Guevara, et al., 2020; Rodríguez & Moreno-Llanos, in press)

Early manifestations of Executive Functions from the end of the first year at the infant school

Presenting Author: Cintia Rodríguez, Universidad Autónoma de Madrid, Spain

Over the past decades the interest in the development of executive functions (EFs) has increased. Following Luria, subjects do not react passively to arriving information, but create intentions, form plans of their action, control their execution and regulate their behavior by comparing the effects of these actions with their original intentions. We know that the first two years are critical concerning the first manifestations of cognitive control (Diamond, 2006), nevertheless, little is known about the origins of EFs in infancy and its early forms of development (Marcovitch & Zelazo, 2009). Various traditions in psychology place language in a hegemonic position (i) the tests are communicated verbally to the subjects. The experimenter says what should be done, when and how. (ii) Implicit or explicitly language is considered the *first/the* instrument of cognitive control. Recently, researchers claim that to study the first manifestations of EFs, language should be left in the background and self-directed gestures and action should be seriously considered (Basilio & Rodríguez, 2017). The ecological validity of standardized tests is been questioned. Significant challenges that the children set in everyday life should be analyzed, rather than the challenges set by the experimenter (Barker & Munakata, 2015), what those challenges consist of and what children do to resolve them (Moro, 2012; Whitebread & Basilio, 2012). In our research group we focus on the following questions: do children set their *own challenges* (goals) from the *end of the first year* of life in everyday situations in classroom 0 – 1? What goals and means consist of and how their semiotic complexity develop? What is the status of *action* with materiality (objects / instruments) and *gestures* in these processes? What is the role of the teacher in this important developmental achievement? (Guevara, et al., 2020; Rodríguez & Moreno-Llanos, in press)

Keynotes I 2

24 August 2021 10:45 - 11:45

Auditorium A

EARLI Keynote Session

Innovative Methods and Technologies for Enhancing Learning and Professional Development

Keywords: Computer-assisted Learning, Educational Technology, Lifelong Learning, Technology

Interest group:

Chairperson: Angelika Kullberg, University of Gothenburg, Sweden

The driving force for research in technology-enhanced learning is a rapidly changing world in which structural change is influencing the entire society and reshaping education and citizenship. The twenty-first century calls for novel, flexible skills and abilities in shared learning and working practices. Therefore, education and lifelong learning must aim not only to nurture the development of specific knowledge and professional competencies but also to support and teach productive learning processes (for example, skills for collaborative learning and creative problem-solving). The preconditions for designing future educational efforts are the analysis and understanding of learning and interaction processes and their contextual adaptations. Specifically, in addition to understanding the effects of technology on learning and professional development, we need to understand how learning and interaction processes occur and unfold over time. Furthermore, the crucial question is how to operationalise our research-based knowledge to provide support for learning and professional development. In this talk, I will discuss the relationship between learners' and teachers' skills and their educational needs in these realms, based on large-scale assessment studies. From this perspective, and with empirical examples, I will further elaborate our research progress in learning and professional development, with examples from intervention studies aiming to target technology-enhanced learning as multilayered and situated phenomena and to provide tools for both researching and supporting learning and professional development. For example, I will consider how research can capture interaction processes (with novel methods) and take the time variable into account to provide valuable insights into how to design, test and refine technologies and approaches for designing and supporting learning and professional development. Finally, because the evolving technological landscape of the digital era crucially influences learning and professional development, the presentation will conclude with the theoretical and practical implications of methods and technologies for enhancing future education and citizenship.

Innovative Methods and Technologies for Enhancing Learning and Professional Development

Presenting Author: Raija Hämäläinen, University of Jyväskylä, Finland

The driving force for research in technology-enhanced learning is a rapidly changing world in which structural change is influencing the entire society and reshaping education and citizenship. The twenty-first century calls for novel, flexible skills and abilities in shared learning and working practices. Therefore, education and lifelong learning must aim not only to nurture the development of specific knowledge and professional competencies but also to support and teach productive learning processes (for example, skills for collaborative learning and creative problem-solving). The preconditions for designing future educational efforts are the analysis and understanding of learning and interaction processes and their contextual adaptations. Specifically, in addition to understanding the effects of technology on learning and professional development, we need to understand how learning and interaction processes occur and unfold over time. Furthermore, the crucial question is how to operationalise our research-based knowledge to provide support for learning and professional development. In this

talk, I will discuss the relationship between learners' and teachers' skills and their educational needs in these realms, based on large-scale assessment studies. From this perspective, and with empirical examples, I will further elaborate our research progress in learning and professional development, with examples from intervention studies aiming to target technology-enhanced learning as multilayered and situated phenomena and to provide tools for both researching and supporting learning and professional development. For example, I will consider how research can capture interaction processes (with novel methods) and take the time variable into account to provide valuable insights into how to design, test and refine technologies and approaches for designing and supporting learning and professional development. Finally, because the evolving technological landscape of the digital era crucially influences learning and professional development, the presentation will conclude with the theoretical and practical implications of methods and technologies for enhancing future education and citizenship.

Session H 1

24 August 2021 12:00 - 13:00

Session Room 4

Single Paper

Teaching and Teacher Education

Pre-service Teacher Professional Development

Keywords: Educational Psychology, Pre-service Teacher Education, Synergies between Learning; Teaching and Research, Teacher Professional Development, Teaching/Instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Emmanuel Manalo, Kyoto University, Japan

What is really important? Results of a study on feedback in the second phase of teacher training

Keywords: Pre-service Teacher Education, Synergies between Learning; Teaching and Research, Teacher Professional Development, Teaching/Instruction

Presenting Author: Stefan Siegel, University of Augsburg, Germany; **Co-Author:** Benedikt Wisniewski, University of Augsburg, Germany

Feedback plays an essential role in the professional development of trainee teachers during their practical training. The content of this feedback is still largely unexplored. In this paper, we investigate what criteria teacher trainers use as a basis for the feedback they give to trainee teachers in the second phase of teacher training. 127 teacher trainers (52 % female, average age: 52.3 years) from 10 of the 16 German federal states took part in the cross-sectional online survey. The frequency of feedback criteria as well as subjective beliefs about teaching quality, and attitudes towards scientific findings were obtained on the basis of self-reports. Qualitative data were analyzed by means of qualitative text analysis, quantitative data by regression analyses and structural equation modelling. The findings indicate that feedback from teacher trainers focuses on the deep structures of teaching quality. Dismissal of scientific findings partly influences the frequency with which characteristics of teaching quality are addressed in feedback. Gender, age and professional experience of teacher trainers have little influence on the content of the feedback they give. Implications for educational research and teacher training will be discussed.

Agency development as a function of identity learning in teacher education

Keywords: Educational Psychology, Pre-service Teacher Education, Teacher Professional Development, Teaching/Instruction

Presenting Author: Monique H.R.M.A van der Heijden, De Kempel University of Applied Sciences, Netherlands; **Co-Author:** Douwe Beijaard, Eindhoven University of Technology, Netherlands; **Co-Author:** Jan Vermunt, Eindhoven University of Technology, Netherlands

Today's and tomorrow's education requires teachers with a positive and strong professional identity. The challenges and issues they face require them not only to be competent teachers, but also to be resilient and innovative teachers. Learning to become and be agentic is seen in this study as an important vehicle for developing and maintaining such a professional identity. This study reports on the impact of a learning trajectory within a larger primary teacher education curriculum that focusses on fostering student teachers' professional agency. A social-constructivist learning environment was created that encouraged the participating student teachers (1) to learn actively in a self-regulated way and (2) to reflect on and make sense of their learning experiences in terms of the teacher they were and/or wanted to become. Interview data were collected and analysed qualitatively with the computer program MAXQDA. Our findings indicate that the participating student teachers have developed their agency, but in different ways because they set personal learning goals that matched both their unique professional identity development and the specific context of their practicum. In their agency development they all focussed to the greatest extent on the following aspects of professional agency: their pupils, their pupils' learning, innovation in their classes, and their own knowledge development. The learning trajectory contributed to actively and consciously becoming aware of what it entails to be a teacher and has given the participants insight into the teachers they wanted to be.

Supporting Student Teachers' Conceptual Knowledge Acquisition Through Example-Based Learning

Keywords: Educational Psychology, Pre-service Teacher Education, Teacher Professional Development, Teaching/Instruction

Presenting Author: Tim Steininger, Albert-Ludwigs-Universität Freiburg, Germany; **Presenting Author:** Thamar Voss, University of Freiburg, Germany; **Co-Author:** Julia Kienzler, Albert-Ludwigs-Universität Freiburg, Germany; **Co-Author:** Joerg Wittwer, University of Freiburg, Germany

Preparing teachers for the complex work of teaching is challenging. A promising way is to support student teachers in acquiring core practices of teaching. Learning a core practice requires an understanding of the conceptual aspects of a core practice. To promote such an understanding, it is important that instruction in teacher education provides student teachers with examples. In this presentation, two experiments are reported that examined the effectiveness of example-based learning for acquiring conceptual knowledge associated with the core practices of writing learning goals and classroom management. Experiment 1 showed that student teachers who categorized examples of learning goals learned about writing learning goals more effectively than student teachers who passively read examples of learning goals or actively generated examples of learning goals. Experiment 2 revealed that student teachers who actively compared examples were successful in acquiring conceptual knowledge about operant conditioning only when they were prompted to focus on critical information about the examples during case comparison. Overall, the results of both experiments indicate that example-based learning is an effective approach to supporting the acquisition of conceptual knowledge in teacher education. However, the way example-based learning is designed obviously influences its effectiveness. Only when student teachers receive sufficient instructional guidance can they effectively benefit from example-based learning. Thus, being left to one's own devices when learning from examples might be too overwhelming for student teachers at the beginning of their professional development.

Session H 2

24 August 2021 12:00 - 13:00

Session Room 14

Single Paper

Learning and Social Interaction, Lifelong Learning

Lifelong Learning and Social Interaction

Keywords: Doctoral Education, Learning Technologies, Lifelong Learning, Professions and Applied Sciences, Qualitative Methods, Researcher Education, Secondary Data Analysis, Secondary Education, Social Interaction, Teaching/Instruction

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 14 - Learning and Professional Development

Chairperson: Meaghan Brugha, University of Cambridge, United Kingdom

Subject talk. Tracing characteristics of social interaction

Keywords: Qualitative Methods, Secondary Education, Social Interaction, Teaching/Instruction

Presenting Author:Astrid Camilla Wiig, University of South-Eastern Norway, Norway; **Co-Author:**Tine Proitz, University of South-Eastern Norway, Norway

In this paper, we explore a new assessment phenomenon observed in practice and most recently formalized by policy uptake within the Norwegian setting. We analyse how teachers and students interact in "subject talks" organized in groups with a particular focus on describing learning outcomes and assessment methods in the nexus of accountable practices. We analyse (N=76) audio-recorded subject talks collected in two lower secondary schools in Norway during the school year of 2017-2018 in Natural science and Norwegian (L1). By tracing characteristics of new learning and assessment practices, our findings point out significant patterns and variations in students' assessment and self-assessment practices, documenting the layers of accountable practices. Preliminary findings display that the layers of accountable practices create opportunities and affordances for students' interactions. In the subject talks, conceptual understanding, deep learning activities and the subject specific concepts are seldom part of teachers' summary of students learning outcome. On the contrary, the accountability to the social community i.e. the group performance in planning, contributing and reflecting over their participation are repeatedly highlighted, thus illuminating subject talks as interactional endeavours. Contributing with new understanding of group subject talks as interactional assessment practices, we discuss the challenge of teacher's feedback across layers of accountability. Focusing mostly on the social dimensions of the group participation, the accountability to conceptual understanding and deep learning activities in the discipline becomes invisible and seems to bring an acceptance of "surface knowledge" over conceptual understanding and deep learning activities.

The relation of professional qualification, collaboration and research performance

Keywords: Doctoral Education, Lifelong Learning, Researcher Education, Secondary Data Analysis

Presenting Author:Agnes Cichy, University of Regensburg, Germany; **Co-Author:**Hans Gruber, University of Regensburg, Germany; **Co-Author:**Tuire Palonen, University of Turku, Finland

The understanding of being a productive researcher and developing research performance has become an important theme in scientific organisations. This study aims to investigate individual and relational variables that are related to research performance and raises the following questions: 1) What are the patterns of collaboration regarding the similarity of individual attributes, level of expertise, and research performance? 2) How are individual attributes, level of expertise and centrality in a collaboration network related to research performance? The sample included all contributions in 50 symposia (involving 388 individuals) at EARLI and EARLI SIG conferences. Data were collected in a secondary data analysis approach from conference books, university homepages and an academic citation software program. Social Network Analysis (SNA) was used to reveal collaboration networks from co-attendance and co-authorship. SNA was also used to calculate the centrality of the researchers. The results indicate only a neutral similarity between the collaborating researchers in regard of their individual attributes and level of expertise. There is no similarity regarding their research performance. The results show that research performance is significantly related to the number of attendances in symposia, level of expertise and centrality within the collaboration network. With regard to research performance, the level of expertise was the strongest predictor and degree centrality, gender and symposia role explained a significant amount of variance as well. The results should contribute to a better understanding about the patterns of collaboration inside the EARLI symposia and variables that are related to research performance.

Design considerations for a systemic approach to technology-supported professional learning

Keywords: Learning Technologies, Lifelong Learning, Professions and Applied Sciences, Qualitative Methods

Presenting Author:Koula Charitonos, The Open university UK, United Kingdom; **Co-Author:**Allison Littlejohn, University College London, United Kingdom; **Co-Author:**Heli Kaatrakoski, University of Stavanger, Norway

In light of emerging complex issues at global scale, the main aim of this paper is to argue for professional learning to be positioned as a systemic concern to enable the active and critical participation of professionals in dynamic and 'fluid' work settings affected by such issues. Adopting this view of professional learning, we present a study which examines professional learning in the context of antimicrobial resistance, a major global challenge concerning the increasing resistance of bacteria to antibiotic medicines. The data to support our claim of the paper stem from an empirical study that involved the design, development and evaluation of two pilot technology-supported professional development programmes for professionals involved in the surveillance of AMR in low-to-middle income countries. We draw on socio-cultural and cultural-historical theories (CHAT) (Engeström, 1987) to discuss how tensions between elements of the local, national and global systems around AMR surveillance serve to frame considerations for the design of the two programmes. We also draw on interviews (face-to-face or online) with participants in the two programmes (n=12 and n=8 respectively) to synthesise evidence how these design considerations led to benefits for these professionals. Our analysis offers new evidence that by attending to appropriate learning design we can create links between professionals involved in AMR surveillance with the social and cultural contexts in which the activity occurs, and also connect local knowledge with emerging global knowledge. This paper can help inform the design of technology-supported programmes for professionals who deal with emerging, complex problems at work.

Session H 3

24 August 2021 12:00 - 13:00

Session Room 2

Single Paper

Assessment and Evaluation, Higher Education

Secondary Education

Keywords: Attitudes and Beliefs, Citizenship Education, Educational Policy, Educational Psychology, Learning Technologies, Quantitative Methods, Secondary Education, Student Learning

Interest group: SIG 04 - Higher Education, SIG 13 - Moral and Democratic Education

Chairperson: Sally Gutierrez, Philippines

On the predictors of Computational Thinking measured with the Computational Thinking Scales

Keywords: Learning Technologies, Quantitative Methods, Secondary Education, Student Learning

Presenting Author:Josef Guggemos, University of St.Gallen, Switzerland

Computational thinking (CT) is regarded as a key 21st-century skill; it may be a valuable resource for solving problems in a wide range of subjects and workplace settings. We aim to investigate predictors of the CT level among high-school students. Based on a review of the literature, predictors are identified and grouped into three areas: (1) student characteristics, (2) home environment, and (3) past learning opportunities. CT is measured with the Computational Thinking Scales (CTS), an established CT self-assessment instrument, that comprises five dimensions: Creativity, Algorithmic thinking, Cooperativity, Critical thinking, and Problem solving. N = 202 high-school students from German-speaking Switzerland (11th grade) act as the sample and linear regression as the analysis method. The best prediction is possible for Algorithmic thinking ($R^2 = .503$); for Cooperativity, it is unsatisfactory ($R^2 = .059$). Other than hypothesized, the female gender positively predicts Creativity and Critical Thinking. Across the five dimensions, the CT self-concept is the best predictor.

Schooling as context for the formation of supranational political support by students in Europe

Keywords: Attitudes and Beliefs, Citizenship Education, Quantitative Methods, Secondary Education

Presenting Author:Katrin Hahn-Laudenberg, University of Wuppertal, Germany; **Co-Author:**Hermann J. Abs, University of Duisburg-Essen, Germany

The paper applies the theory of political support as part of political cultural research while analyzing data from the International Civic and Citizenship Education Study (ICCS 2016) from 14 European educational systems (N=46,500; 14-year-old students). It explores to which extent schooling (learning opportunities about Europe, student-teacher relations and civic knowledge) fosters political support of students towards the EU. As indicators for different dimensions of political support, trust in political institutions (national and supranational), attitudes towards supranationality and attitudes towards the performance of the EU are examined. The relation between national and supranational institutional trust and their relation to civic knowledge vary systematically depending on indicators of state functioning, such as freedom of corruption in the EU member states. In-depth analyses for NRW (N=1,451 students) find – largely in line with the

theoretical assumptions – that the aspects of schooling effect the different dimensions of political support; only political knowledge shows no direct effect on the assessment of EU-performance. Trust in political institutions and attitudes towards supranationality mediate the effect of political knowledge on the positive assessment of the EU-performance.

Prediction of teacher education students academic achievement based on the matriculation examination

Keywords: Educational Policy, Educational Psychology, Quantitative Methods, Secondary Education

Presenting Author:Jenni Kunnari, University of Oulu, Finland; **Co-Author:**Jouni Pursiainen, University of Oulu, Finland; **Co-Author:**Hanni Muukkonen, University of Oulu, Finland

We examine academic achievement (study success and progress) among teacher education (TE) students based on their accomplished tests and gained grades in the national matriculation examination (ME). The study covers the undergraduate time of students who enrolled in teacher education in one Finnish university in 2007–2014 (N=1271). We examine with statistical analysis the register based data which consist of the following independent variables: the enrolled students high school GPA based on the ME, number of tests taken, and the number of gap years before enrolling in TE. The dependent variables study success (GPA at the end of 1st, 2nd, and 3rd study year), and study progress (study credits at the end of each study year). The results are in line with prior research results. The high school GPA was a significant predictor of 1st year study success, and high school GPA together with 1st year study success was a significant predictor of 2nd year study success. The best predictors of 3rd year study success was 1st and 2nd year study success. Due to a university admission renewal which took place in 2020, the ME is currently emphasized in admission to Finnish universities. Therefore, it is needed to examine academic achievement based on the ME among those who were chosen to TE with the former admission criteria which emphasized the entrance examination.

Session H 4

24 August 2021 12:00 - 13:00

Session Room 6

Single Paper

Instructional Design, Learning and Instructional Technology

Learning Technologies

Keywords: Communities of Learners, Comprehension of Text and Graphics, Cooperative/Collaborative Learning, E-Learning/Online Learning, Experimental Studies, Instructional Design, Learning Technologies, Multimedia Learning, Science Education

Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Mariette van Loon, University of Bern, Switzerland

Learning from Erroneous Worked-Examples. The Influence of Type of Error and Prior Knowledge

Keywords: Experimental Studies, Instructional Design, Learning Technologies, Multimedia Learning

Presenting Author:Maik Beege, Chemnitz University of Technology, Germany; **Co-Author:**Steve Nebel, Chemnitz University of Technology, Germany; **Co-Author:**Sascha Schneider, Chemnitz University of Technology, Germany; **Co-Author:**Justus Zimm, TU Chemnitz, Germany; **Co-Author:**Günter Daniel Rey, Chemnitz University of Technology, Germany

Learning from erroneous worked-examples has been shown to enhance learning in contrast to basic problem-solving tasks. However, the type of error was hypothesized to be a possible moderator of this effect. Two studies examined the influence of syntactic (all rules that determine the structure of a sentence or code) and semantic (the logic or content of a sentence or code) errors in a programming learning scenario. In the first experiment, 128 students were randomly assigned to one cell of a two (syntactic errors: yes vs. no) × two (semantic errors: yes vs. no) factorial between-subjects design. Students' correctness in error detection, learning performance, mental load, and mental effort were measured. Results showed that learners receiving syntactic errors detected and corrected errors with higher accuracy which leads to higher learning performance. Prior experience was shown to be a significant moderator of this effect. In the second study, the role of prior knowledge is currently further investigated. Students are randomly assigned to a two (induced prior knowledge: yes vs. no; between) × three (errors: syntactic vs. semantic vs. no errors; within) factorial mixed design. This follow-up study is currently under investigation and results will be provided at the EARLI 2021 conference.

Using microblogging and the language of possibility to create a space for open, reasoned debate

Keywords: Communities of Learners, Cooperative/Collaborative Learning, Learning Technologies, Science Education

Presenting Author:Paul Warwick, University of Cambridge, United Kingdom; **Co-Author:**Victoria Cook, University of Cambridge, UK, United Kingdom; **Co-Author:**Jan Dolonen, University of Oslo, Norway

Facilitating productive technology-mediated dialogue is a challenging task. In this paper, we consider the role that the language of possibility and a microblogging tool, '[tool]', play in promoting a space for open, reasoned debate within the study of socioscientific issues. Data for this research was drawn from a four-year international design-based research project exploring how '[tool]' is used within the context of 'dialogic classrooms'. The analysis focuses on one 'case' science lesson with students aged 11-12 years. We find that the invitational nature of the language of possibility may facilitate the exploration of other people's evolving and emergent ideas within the provisional, shared space created by '[tool]'. We discuss how the language of possibility may encourage students to build on, justify and challenge ideas, identifying the specific dialogue markers associated with the language of possibility that may be used to open up a dialogic space that encourages open, reasoned debate.

Online Dance Instructor: The influence of multiple perspectives and model orientation on learning

Keywords: Comprehension of Text and Graphics, E-Learning/Online Learning, Instructional Design, Learning Technologies

Presenting Author:Birgit Brucker, Leibniz-Institut für Wissensmedien (IWM), Germany; **Co-Author:**Sophie Hornuff, Eberhard Karls Universität Tübingen, Germany; **Co-Author:**Marc Halfmann, Leibniz-Institut für Wissensmedien (IWM), Germany; **Co-Author:**Peter Gerjets, Leibniz-Institut für Wissensmedien (IWM); Eberhard Karls Universität Tübingen, Germany

There is strong evidence that learning about human movements is fostered by dynamic visualizations. However, not only characteristics of the learners, but also specific characteristics of the dynamic visualizations themselves might moderate their instructional efficiency. This study addressed in a 2x3-between-subjects-design the questions whether it is helpful for learning about samba dance steps to show multiple perspectives (as compared to only one perspective) simultaneously in multiple dynamic visualizations in a virtual online learning environment and which role the model orientation plays by contrasting an objective model orientation with a mirrored model orientation and a subjective model orientation. Moreover, learners' visuospatial ability was assessed as a third factor. Learning was measured with three tests: participants had to (a) choose the correct names for dance steps; (b) identify previously learned dance steps in comparison to distractor dance steps, and (c) correctly identify verbal descriptions about the dance steps. Results showed a general positive effect of learners' visuospatial ability on all three tests. Moreover, multiple perspectives were helpful for correctly naming the dance steps. Furthermore, during identifying dance steps there was a significant interaction between number of perspectives and visuospatial ability: Numerically, learners with higher visuospatial ability profited, whereas learners with lower visuospatial ability suffered from multiple perspectives. The model orientation did not influence learning in this study. In sum, these findings show that multiple perspectives in terms of multiple dynamic visualizations can be helpful during learning about human movements in virtual online learning environments – at least for learners with higher visuospatial ability.

Session H 5

24 August 2021 12:00 - 13:00

Session Room 10
Single Paper
Higher Education, Teaching and Teacher Education

Pre-service Teacher Education

Keywords: Attitudes and Beliefs, Comparative Studies, Higher Education, Motivation, Pre-service Teacher Education, Reasoning

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Alessia Eletta Coppi, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland

Fostering utility-value of educational research evidence in future teachers

Keywords: Attitudes and Beliefs, Higher Education, Motivation, Pre-service Teacher Education

Presenting Author: Maximilian Knogler, Technical University of Munich (TUM), Germany; **Co-Author:** Ricardo Böheim, University of Augsburg, Germany; **Co-Author:** Annika Diery, Technical University of Munich (TUM), Germany; **Co-Author:** Tina Seidel, Technische Universität München, Germany; **Co-Author:** Judith Harackiewicz, University of Wisconsin-Madison, United States

Following the movement toward evidence-based practice in education, teaching is regarded as a profession that requires teachers to act and argue based on research evidence. According to expectancy-value theory, a critical variable in promoting evidence-based practice among future teachers is the extent to which they consider research evidence useful for their teaching practice (i.e. utility-value). To further promote utility-value of research evidence among teacher students, the present study investigated the added value of a brief and easy-to-implement intervention that stimulates students to reflect on the utility-value of research evidence. The sample consisted of 3rd semester teacher students ($n = 34$) enrolled in a semester-long course on effective teaching who were randomly assigned to two conditions. In the first condition (typical course design), teacher educators used two typically applied strategies for promoting utility-value, i.e. direct communication of utility-value and application tasks, in which students can discover utility-value. In the second condition (enhanced course design), students were additionally stimulated to reflect on the utility-value in two written assignments. Their value perceptions were measured at the beginning and at the end of the semester. Although a mixed model MANOVA did not yield a statistically significant group-by-time interaction effect, follow-up t-tests revealed a substantial and significant increase in students value perceptions in the enhanced course design, but not in the typical course design. To further investigate the impact of the different course designs and to increase the statistical power of our analyses, we are currently collecting data from another cohort to increase sample size.

Students' motivations for choosing a teacher training or non-teacher training programme

Keywords: Comparative Studies, Higher Education, Motivation, Pre-service Teacher Education

Presenting Author: Robin Göller, Leuphana University Lueneburg, Germany; **Presenting Author:** Michael Besser, Leuphana Universität Lüneburg, Germany

The motivations for prospective students' decision to study for a teaching degree are an important predictor for the development of professional competence. In absolute terms, student teachers' motivations for choosing a teacher training programme are well-researched, however, there are no explicit studies on differences in the motivations of applicants for a teacher training programme compared to applicants for other programmes, which were conducted using standardised and reliable questionnaire scales. This submission addresses this desideratum and examines applicants' motivations for choosing different courses of study using a questionnaire developed for surveys on different study programmes. Results show that teacher students and non-teacher students differ significantly in all measured study choice motivations. The results are discussed critically, especially with regard to the concrete contents and structures of university teacher training programmes.

Using the Theory of Planned Behavior to Explain Pre-Service Teachers' Evidence-Informed Reasoning

Keywords: Attitudes and Beliefs, Motivation, Pre-service Teacher Education, Reasoning

Presenting Author: Martin Greisel, University of Augsburg, Germany; **Co-Author:** Christina Wekerle, University of Augsburg, Germany; **Co-Author:** Theresa Wilkes, Saarland University, Germany; **Co-Author:** Kati Trempler, University of Wuppertal, Germany; **Co-Author:** Robin Stark, Saarland University, Germany; **Co-Author:** Ingo Kollar, University of Augsburg, Germany

In their everyday practice, teachers are typically confronted with various classroom-related challenges (e.g., students might have difficulties understanding new concepts). However, they rarely reason about such challenges in an evidence-informed manner. Using the theory of planned behavior, we examined which motivational prerequisites might facilitate pre-service teachers' engagement in evidence-informed reasoning about classroom-related challenges. $N = 157$ pre-service teachers were asked about their motivation to engage in evidence-informed reasoning and analyzed case scenarios of problematic teaching situations in an online learning environment. Structural equation modeling indicated that attainment value, descriptive normative beliefs, and self-efficacy were important prerequisites for the formation of intentions to engage in evidence-informed reasoning and the subjectively perceived behavior in order to solve classroom-related challenges. The findings suggest that it might be a promising way to foster pre-service teachers' engagement in evidence-informed reasoning by integrating in-service teachers in teacher training curricula as role models for evidence-informed reasoning.

Session H 6

24 August 2021 12:00 - 13:00

Session Room 11

Single Paper

Learning and Social Interaction, Teaching and Teacher Education

Citizenship Education

Keywords: Arts, Citizenship Education, Learning Approaches, Phenomenography, Qualitative Methods, Social Interaction, Social Sciences, Teaching/Instruction, Video Analysis

Interest group: SIG 09 - Phenomenography and Variation Theory, SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education

Chairperson: Tatiana Shubina, University of Oulu, Finland, Finland

How classroom interaction supports citizenship education: An ethnography of using prior knowledge

Keywords: Citizenship Education, Social Interaction, Teaching/Instruction, Video Analysis

Presenting Author: Ivy Lau, Hong Kong Baptist University, Hong Kong

It is not easy to be a teacher in the 21st century. Literature has identified various ways of effective teacher facilitation in classroom learning. One of them is the regulation of classroom interaction. In examining such a mechanism, this ethnography explored qualitatively how prior knowledge supported citizenship education in Hong Kong. Results suggested that different classroom interaction patterns were the key features, while they all relied on how teachers' response and interpretation. The accumulation of prior knowledge became tremendous, with a group setting that involved individual input. Such development of conceptual resources regulated whole-class discussion. Besides, a hierarchy of feedback depicted various driving forces in citizenship education for both rational and emotional judgment. Overall, the study highlights how teachers could use prior knowledge in examining social issues to support citizenship education.

Hard talk: exploring citizenship through arts education in a Chilean public school.

Keywords: Arts, Citizenship Education, Qualitative Methods, Teaching/Instruction

Presenting Author: Rosario Palacios, Centro de Justicia Educacional Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Sofia Larrazabal, Pontificia

Universidad Católica de Chile, Chile; **Co-Author:**Isidora Herrera, Pontificia Universidad Católica de Chile, Chile

The present research analyses the experience of an educational programme run by a non-profit organisation in a public school in Chile during 2020, which proposed Arts lessons based in contemporary art methodologies. The focus of our study was to describe and analyse the ways in which citizenship was reflected through Arts lessons and students' responses to it. We found that students are not used to talking much about citizenship issues and not show critical thinking skills. They need to be conducted to challenging assumptions, and questioning and contemporary art methodologies appear as an interesting resource for that purpose. Students declare little interest and knowledge in how the country is organised and the rights and duties citizens have. They show affection for their family and friends, school and neighbourhood, and respect for them. Environmental issues have a place in their understandings of what is essential for collective living and future development.

'I can't remember of what it taught' - young adults experiences of schools' financial education

Keywords: Citizenship Education, Learning Approaches, Phenomenography, Social Sciences

Presenting Author:Marilla Kortesalmi, Laurea University of Applied Sciences, Finland; **Co-Author:**Minna Autio, Universitiy of Helsinki, Finland; **Co-Author:**Mette Ranta, University of Jyväskylä, Finland

The schools have significant role in providing financial education for young adults. Financial capabilities are important when implementing healthy financial behaviour. However, they often experience lack of confidence. In this research, we study how young adults value the schools' financial education and how they perceive its role. Our data consists semi-structured interviews (n=18) of 20-26 years old adults. We argue that young adults appreciate and criticise the schools' financial education. It is appreciated when carried the societal values or was able to utilise in everyday life. Criticised education was unable to utilise or the teaching was lacking necessary information. They perceived three roles of schools' financial education, it effects to the society, it has a pedagogical role, and financial education was able to even the differences in backgrounds. We argue that financial education should adapt practical methods and utilise relevant financial information in order to educate them financially independent citizens.

Session H 7

24 August 2021 12:00 - 13:00

Session Room 9

Single Paper

Learning and Instructional Technology, Motivational, Social and Affective Processes

Cognitive Skills and Motivation

Keywords: Achievement, Cognitive Skills, Learning Technologies, Motivation, Motivation and Emotion, Teaching/Instruction

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Lihong Huang, Norway

Cognitive abilities, trait interests, and educational preferences

Keywords: Cognitive Skills, Motivation, Motivation and Emotion, Teaching/Instruction

Presenting Author:Jeroen Lavrijsen, KU Leuven, Belgium; **Co-Author:**Terence Tracey, Arizona State University, United States; **Co-Author:**Pieter Verachtert, KU LEUVEN, Belgium; **Co-Author:**Tine De Vroede, KU LEUVEN, Belgium; **Co-Author:**Bart Soenens, Ghent University, Belgium; **Co-Author:**Karine Verschueren, KU Leuven, Belgium

Why do students prefer one subject (e.g., mathematics) over another (e.g., languages)? This study considered how both student individual dispositions and environment factors shaped the educational preferences of a large sample of 3,409 Flemish middle-school students. First, trait interests (RIASEC) were found to predict which school subject students indicated to like the best in general accordance with vocational interest theory. Accordingly, cognitive abilities were differentially related to subject liking, with different favorite subjects associated with high fluid intelligence (in particular, mathematics) and with high crystallized intelligence (in particular, history and Dutch). However, beyond individual dispositions, subject liking was also found to depend on teacher behavior. In particular, the degree students perceived their mathematics and French subject teacher to be engaging (that is, teachers that are passionate about their subject and succeed in connecting it to students' lives) uniquely predicted how students liked to do these subjects, beyond trait interests and cognitive abilities. This suggests teachers to play a pivotal role in promoting subject engagement and enjoyment among their students.

Which Motivational Processes Predict Academic Achievement Beyond Intelligence and Personality?

Keywords: Achievement, Cognitive Skills, Motivation, Motivation and Emotion

Presenting Author:Jeroen Lavrijsen, KU Leuven, Belgium; **Co-Author:**Maarten Vansteenkiste, Ghent University, Belgium; **Co-Author:**Michiel Boncquet, Universiteit Gent, Belgium; **Co-Author:**Karine Verschueren, KU Leuven, Belgium

While bivariate associations between motivation and academic achievement have been soundly established, only a handful of studies have documented evidence for its incremental predictive role above and beyond other student features related to student achievement, such as intelligence and personality. Moreover, it is not yet clear which motivational processes are most essential for academic achievement. The current study considered the supplementary effect of an array of motivational constructs on academic achievement, accounting for intelligence and personality, in a large sample of Flemish 7th graders. Students' intelligence and need for cognition, that is, the personal preference to engage in cognitively demanding work, proved to be strong predictors of academic achievement. Yet, even after controlling for the effects of intelligence and personality, several motivational processes explained additional, unique variance in achievement, totaling about a quarter of the explained variance in school results. In particular, academic self-concept proved to have the largest effect on achievement, while achievement goals, achievement motivation, autonomous motivation, and effort beliefs additionally explained a unique portion of academic achievement. Although these findings were largely consistent across different operationalizations of achievement, motivational constructs explained more variance when achievement was measured with school grades instead of standardized tests. Given the more malleable nature of motivational dynamics compared to intelligence and personality differences, the current findings suggest that educators do well to foster student motivation to enhance academic performance.

Learning Strategy Deployment and Achievement Goal Orientation within MetaTutor

Keywords: Achievement, Cognitive Skills, Learning Technologies, Motivation

Presenting Author:Megan Wiedbusch, University of Central Florida, United States; **Co-Author:**Roger Azevedo, University of Central Florida, United States

Multiple models of self-regulated learning (SRL^[1]) suggest that motivational orientation is a vital factor in the types of strategies that learners use and should be considered in the development of effective intelligent scaffolding aids. The Achievement Goal Questionnaire-Revised (AGQ-R^[2]) was used to measure achievement goal orientation from 121 undergraduate students learning about the human circulatory system with MetaTutor. The questionnaire was used to examine how note-taking behaviors differed among learners and their relationship with performance. Results indicate that learners who took notes outperformed their peers that chose not to note take. Learners who did not take notes reported higher values of performance-avoidance items suggesting that different orientations might result in different self-prompted learning strategy use.

Session H 8

24 August 2021 12:00 - 13:00

Session Room 8

Single Paper

Educational Policy and Systems, Learning and Social Interaction, Teaching and Teacher Education

Social Interaction in Primary Education

Keywords: Argumentation, Citizenship Education, Educational Policy, Motivation, Parental Involvement in Learning, Primary Education, Science Education, Social Interaction, Video Analysis

Interest group: SIG 11 - Teaching and Teacher Education, SIG 23 - Educational Evaluation, Accountability and School Improvement (merged with SIG 18), SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Anna-Lena Ekdahl, Jönköping University, Sweden

Social Reproduction through Specialized Classes in Czechia: Why do Parents Dodge their Local School?

Keywords: Educational Policy, Parental Involvement in Learning, Primary Education, Social Interaction

Presenting Author: Radka Smith Slámová, Institute for Research and Development of Education, Faculty of Education, Charles University in Prague, Czech Republic

Specialized classes functioning in several European countries (Finland, Germany, Czechia) have raised concerns about equitable educational access due to their propensity to stratify pupils along socioeconomic lines. These classes popular among middle-class parents typically function within a regular public school and, unlike other classes, offer a specific educational approach (e.g., Montessori, Waldorf) or extended curricula in certain subjects (e.g., mathematics, languages). The paper explores parental motivation for choosing such classes in urban Czechia with the aim of illuminating how public schools could remain appealing to this group of parents while staying true to their inclusive mission. Guided by the design of constructivist grounded theory, twenty-five interviews with parents interested in specialized classes and with school representatives were completed and continually analyzed in 2018–2020. The interviews focused on meanings attached to school choice criteria, schools considered, reasons for rejecting the local public school, and the contextual characteristics shaping the choice. The results revealed that parents sought out specialized classes for several *assurance mechanisms* mitigating their fears associated with public schools: oversight by an external institution, student selection based on aptitude/parents' values, additional resources for hiring teachers, transparency of core values, and openness to parent involvement. Several policy suggestions emerged from the study that would allow the public schools to leverage middle-class parents' involvement while also promoting collaboration and a sense of belonging among all pupils.

Taking on a task: Children handling the premises of group discussions about democratic concepts

Keywords: Argumentation, Citizenship Education, Social Interaction, Video Analysis

Presenting Author: Lea Eldstål-Ahrens, University of Gothenburg, Sweden; **Co-Author:** Niklas Pramling, University of Gothenburg, Sweden; **Co-Author:** Malin Nilsen, University of Gothenburg, Sweden

Within a sociocultural and dialogic perspective on learning, argumentation is one of the key cultural practices to be appropriated in order to effectively participate in democratic societies as active citizens. This study aims to analyze and characterize German primary school children's argumentation in collaborative group discussions about democratic concepts and practices. 13 group discussions of 4-5 children each (total participant $n=54$) were video recorded by the participating teachers in the school setting, transcribed and analyzed using interaction analysis and sociocultural discourse analysis. The results demonstrate the children handling the premises of the given tasks in three different ways: (1) arguing within the stated premises, (2) arguing outside the stated premises by changing them (e.g., adding premises) or (3) questioning the premises openly. The findings reveal a more dynamic way of understanding tasks than has generally been found in educational research. Tasks, even when clarified and re-stated in teacher-student interaction, remain open to interpretation and have to be negotiated in a process of sense making both between the students as part of the group and between the group and the teacher.

Effects of Teacher Feedback on Children's Self-Concepts and Motivation in Science Lessons

Keywords: Motivation, Primary Education, Science Education, Social Interaction

Presenting Author: Fabian Hoya, Paderborn University, Germany; **Co-Author:** Jan R. Schulze, Paderborn University, Germany; **Co-Author:** Eva Blumberg, Paderborn University, Germany; **Co-Author:** Frank Hellmich, Paderborn University, Germany

Feedback is an important determinant for children's learning processes. It is defined as an information of a reference person (e.g., parents, teachers, peers) with the aim to support students' learning processes (Hattie & Timperley, 2007). Teacher feedback can lead to an increase or a decrease in students' self-cognitions and their motivation. Correlations between teacher feedback, children's self-concepts and their motivation could be proven in several studies (Burnett, 1999; Chen, Thompson, Kromrey, & Chang, 2011; Henderlong Corpus & Lepper, 2007). Following, Eccles' (2005) 'Expectancy-Value-Theory', teacher feedback influences students' self-concepts, whereas the development of students' self-concepts affects their intrinsic and extrinsic motivation. However, evidence for these concrete effect mechanisms is still pending. Therefore, $N=744$ third and fourth graders in Germany were asked to give information on their perceived positive and negative teacher feedback in primary school science lessons. Furthermore, the primary school students filled in a questionnaire on their motivation and their self-concepts. The results of a structural equation model expectedly show that the effect of the perceived positive teacher feedback on children's intrinsic motivation is significantly mediated by their self-concepts. Moreover, children's self-concepts mediate the effect of their perceived negative teacher feedback on their extrinsic motivation.

Session H 9

24 August 2021 12:00 - 13:00

Session Room 7

Single Paper

Cognitive Science, Instructional Design, Learning and Special Education

Self-regulation

Keywords: Literacy, Metacognition, Primary Education, Problem Solving, Self-regulation, Teaching/Instruction

Interest group: SIG 12 - Writing, SIG 16 - Metacognition

Chairperson: Attila Pásztor, MTA-SZTE Research Group on the Development of Competencies, Hungary

The relation between self-regulation and contextual- instructional characteristics of activities.

Keywords: Metacognition, Primary Education, Self-regulation, Teaching/Instruction

Presenting Author: Antonia Zachariou, University of Roehampton, United Kingdom

The aim of the current study was to explore the extent to which children's self-regulation differs across activities with different contextual and instructional characteristics. This was constructed on the basis of recent research which emphasises the role of the context in promoting self-regulation development. 36 children aged 6 to 8 participated in a variety of activities in instructional contexts that differed in terms of: i) level of teacher involvement, ii) whether activities were teacher-initiated and -led or child-initiated and -led, and iii) social context, i.e. individual, pair or group tasks. Children's self-regulation was coded on the basis of the C.Ind.Le coding framework. More than 15,000 micro-episodes of self-regulatory behaviours were analysed. The results for this paper indicate that the level of teacher involvement, whether the task was child- or teacher-initiated and led and whether it was an individual, pair or group task all had an effect on the rates of children's self-regulation. The children showed a statistically significant higher rate of self-regulation when the teacher was absent, compared to when she was involved in the activity or just present. More self-regulation was evident when the activity was either completely teacher-initiated and led or child-initiated and led, compared to teacher-initiated but child-led. Finally, the rate of self-regulation was significantly higher in pair activities and individual activities, compared to larger-group activities. These findings can only be interpreted with caution, but could potentially inform practice, since they support the belief that the contextual and instructional characteristics of activities are important in promoting self-regulation.

Self-Regulation in Early Writing Instruction

Keywords: Literacy, Primary Education, Self-regulation, Teaching/Instruction

Presenting Author: Perry Klein, The University of Western Ontario, Canada; **Co-Author:** Ashley Bildfell, Western University, Canada; **Co-Author:** Jill

Dombroski, The University of Western Ontario, Canada; **Co-Author:**Christine Giese, The University of Western Ontario, Canada; **Co-Author:**Kristen Wing-Yan Sha, The University of Western Ontario, Canada; **Co-Author:**Serena Thompson, The University of Western Ontario, Canada

Recently, research on strategy instruction has begun to focus on beginning writers. This study investigated the role of self-regulation instruction in Grade 1 strategy instruction. The proposed presentation will focus on 81 matched Grade 1 students from 9 classes who participated in a unit of study on personal narrative in one of three conditions: 1) full Self-Regulated Strategy Development (SRSD, Harris & Graham, 2009), which included instruction in goal-setting, strategy steps, coping, self-monitoring, and self-reinforcement; 2) strategy instruction only (SO), comprised of learning about the personal narrative genre and the steps of the strategy; 3) a control condition comprised of normal writing education. Students in both strategy conditions, relative to the control, made large, statistically significant gains in text quality, word count, story features, and self-regulatory knowledge. The SRSD condition resulted in greater self-regulatory knowledge than the SO condition, which resulted in greater knowledge than the control. The SRSD and SO conditions did not differ significantly in their effect on writing measures. The effect of instruction did not interact significantly with pretest text quality, that is, instruction was approximately equally effective for students scoring low, medium and high at pretest.

Effects of Self-Scoring Math Problem Solutions on 4th Grade Students' Monitoring and Regulation

Keywords: Metacognition, Primary Education, Problem Solving, Self-regulation

Presenting Author:Sophie Oudman, Utrecht University, Netherlands; **Co-Author:**Janneke van de Pol, Utrecht University, Netherlands; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

Preparing students to become self-regulated learners has become an important goal of primary education. Therefore, it is important to investigate how we can improve self-monitoring and self-regulation accuracy in primary school students. Focusing on mathematics problems, we investigated whether and how 1) high- and low-performing students differed in their monitoring accuracy (i.e., extent to which students' monitoring judgments match their actual performance) and regulation accuracy (i.e., extent to which students' regulation judgments regarding the need for further instruction/practice match their actual need), 2) self-scoring improved students' monitoring and regulation accuracy, 3) high- and low-performing students differed in their monitoring and regulation accuracy after self-scoring, and 4) students' monitoring and regulation judgments are related. On two days, students of approximately 9-10 years old from 34 classes solved multiplication and division problems and made monitoring and regulation judgments after each problem type. Next, they self-scored their answers and again made monitoring and regulation judgments. On the multiplication problems, high-performing students made more accurate monitoring and regulation judgments before and after self-scoring than low-performing students. On the division problems, high-performing students made more accurate monitoring judgments before self-scoring than low-performing students, but after self-scoring this difference was no longer present. Self-scoring improved students' monitoring and regulation accuracy, except for high-performing students' regulation accuracy on the division problems. Students' monitoring and regulation judgments were related. Our findings suggest that self-scoring may be a suitable tool to foster primary school students' monitoring accuracy and that this translates to some extent into more accurate regulation decisions.

Session H 10

24 August 2021 12:00 - 13:00

Session Room 16

Single Paper

Assessment and Evaluation, Teaching and Teacher Education

Teaching and Instruction in Primary Education

Keywords: Case Studies, Instructional Design, Primary Education, Social Interaction, Teacher Effectiveness, Teaching Approaches, Teaching/Instruction

Interest group: SIG 27 - Online Measures of Learning Processes

Chairperson: Nicola Reimann, Durham University, United Kingdom

Teaching effectiveness in primary education: Combining the Dynamic Model with dialogic pedagogy

Keywords: Primary Education, Social Interaction, Teacher Effectiveness, Teaching/Instruction

Presenting Author:Leonidas Kyriakides, University of Cyprus, Cyprus; **Co-Author:**Maria Vrikki, University of Cyprus, Cyprus

The quality of teaching is considered to be the strongest predictor of students' achievement. While existing theoretical models have been able to determine certain factors that affect student achievement, a large part of students' achievement variance still remains unexplained. The present paper aims to contribute to this literature by investigating the impact of an integrated theoretical model of teacher effectiveness. This model combines generic factors emerging from the Dynamic Model of Educational Effectiveness (Creemers & Kyriakides, 2008) and dialogic pedagogy; the latter refers to the extent to which students participate in classroom dialogue to develop their learning and understanding. Data are collected from 29 primary school teachers in Cyprus and their students ($n = 604$). Classroom observation data provide information on teaching behaviour, while data from written tests in mathematics and the Greek language, at the beginning and end of the school year, provide information on students' achievement. The study employs multilevel regression analysis techniques to determine the effect of teaching on student achievement. The results of the analyses support the consideration of dialogic pedagogical approaches in the study of teaching effectiveness. Implications for teacher professional development and policy are discussed.

Students' basic academic skills & individual support needs associate with teacher focus of attention

Keywords: Case Studies, Instructional Design, Primary Education, Teaching/Instruction

Presenting Author:Saswati Chaudhuri, University of Jyväskylä, Finland; **Co-Author:**Heli Muonen, University of Jyväskylä, Finland; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

Students' academic skills and need for support can vary largely even within one classroom, in particular in the first grade. At the same time, teachers are expected to meet the individual needs of the students and provide support and attention to them. The present study used mobile eye-tracking involving teachers ($n = 46$) from Grade 1 and examined two aims, firstly, to what extent students' basic academic skills and need for individual support in basic academic skills are associated with teacher focus of attention. Secondly, how students' basic academic skills and need for individual support in basic academic skills are reflected in teacher focus of attention. For the case study part, one classroom with overall high individual support needs and one with overall low individual support needs in basic academic needs were selected for closer examination. The results revealed that basic academic skills and students' need for individual support correlated with teacher focus of attention. Next, the results indicated that teacher focus of attention varied significantly between high individual support needs and low individual support needs classrooms. In the high individual support needs classroom, students needing more individual support in academic skills received less teacher focus of attention than other students. In low individual support needs classroom, students needing high individual support received more focus of attention from the teacher. This study suggests that number of students with high individual support needs must be uniformly distributed among classrooms to ensure adequate individual teacher focus of attention supporting basic academic skills.

Teachers' occupational well-being during Covid-19 pandemic

Keywords: Primary Education, Social Interaction, Teaching Approaches, Teaching/Instruction

Presenting Author:Sanni Pöysä, University of Jyväskylä, Finland; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

This study focused on teachers' occupational well-being during Covid-19 pandemic. It examined the extent to which teachers' experiences of increased stress due to the Covid-19 situation are associated with their perceptions of work-related exhaustion and their recovery from work. In addition, it assessed the extent to which experiences of increased stress are related to their views on their own interactional styles of teaching. The participants were 278 Grade 1-6 teachers in Finland. Participants filled out electronic questionnaires regarding their occupational well-being and teaching styles during the time when they worked mostly remotely due to the Covid-19 pandemic (April/May of 2020). The results showed that most of the participating teachers experienced work-related stress in Spring

2020, and Covid-19 situation had increased their stress. The analysis of variances (ANOVAs) that were executed with respect to teachers' assessments of their increased stress due the Covid-19 pandemic showed, first, that teachers' experiences of increased stress were associated with their increased emotional exhaustion and their reduced recovery from work. In addition, the findings suggested that teachers' perceptions of increased stress were associated with their interactional styles of teaching. It seemed that teachers, who value more the positive relationship with their students and importance of maintaining clear expectations for the students' behavior, were the ones, who also reported more stress due the Covid-19 situation. Findings of this study highlight that the global pandemic can be harmful for teachers' occupational well-being, and we should find ways to support them to avoid increased stress and exhaustion levels.

Session H 11

24 August 2021 12:00 - 13:00

Session Room 1

Single Paper

Culture, Morality, Religion and Education, Higher Education, Learning and Instructional Technology

Communities of Practice

Keywords: Communities of Practice, Culture, Educational Policy, Ethnography, Higher Education, Learning Technologies, Lifelong Learning, Qualitative Methods

Interest group: SIG 04 - Higher Education, SIG 14 - Learning and Professional Development, SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Tamara Kastorff, Ludwig-Maximilians-Universität (LMU), Germany

Between Managerialism and Collegialism: Educational Innovators' Networks in Higher Education

Keywords: Communities of Practice, Culture, Educational Policy, Higher Education

Presenting Author: Tobias Jenert, Paderborn University, Germany

With the ongoing expansion of Higher Education, the quality of teaching and learning has gained increasing interest. To develop sustainable innovations for HE teaching and learning it is vital to understand the mechanisms of educational change in the HEI contexts. In the past, HEI have been described as "organized anarchies" (Cohen et al., 1972). Newer institutional theories suggest that in central Europe HEI have developed into more managed organizations where coordinated organizational projects such as educational change are possible. The aim of the present study is to develop our understanding of the processes of educational change in HEI by investigating networks of educational innovators and relating them to institutional characteristics HEI as outlined by different institutional theories. To tackle these questions, we conducted two network studies, the fist investigating a network of 230 educational innovators, the second analysing the individual networks of 12 innovators who we identified as particularly important for the overall network. Our studies show that there are different ways to promote educational innovation and change. While often depicted as conflicting institutional conceptions, we found that the networks of some successful educational innovators correspond with a (strategically motivated) managerial conception of HEI while others are rather in line with an (academically motivated) collegial conception. Both conceptions seem to be applicable and functional; however, they have different scopes when developing educational innovation.

"Otherwise, you can play driving the boat on your PlayStation instead": Simulator-based training

Keywords: Communities of Practice, Ethnography, Learning Technologies, Qualitative Methods

Presenting Author: ANASTASIA SKARPETI, NTNU - Norwegian University of Science and Technology, Norway; **Co-Author:** Charlott Sellberg, University of Gothenburg, Sweden

"Otherwise you can play driving the boat on your PlayStation instead": Simulator-based training The aims of this paper are twofold, first, we will introduce a framework for the analysis of professional learning in simulator-based training. This framework allows us to define *fidelity* in three observable dimensions: *technical, interactional, and environmental*. Secondly, we argue that the focus on *fidelity* in research on simulations might be too narrow to understand simulations as part of a broader curriculum, and provide evidence to how curricula is a central dimension in simulator-based training. The analysis draws on sociocultural and socio-material theories to explore how the simulator environment, contribute to the learning process. Ethnographic data from observations and informal interviews, video recordings, and group discussions are used to examine the role and importance of simulator fidelity for the students' learning experience. The study design of combining and relating different sets of data shows the value of triangulating methods and perspectives in order to gain a holistic understanding of the relation between different dimensions of learning from simulations. In particular, the analysis indicates how the prior experiences of students, the course materials, and the design of the task are as important features of learning from simulator exercises as the simulation itself. The results demonstrate how and why currently reductionist and micro-analytical approaches for studying simulators in professional learning need to be complemented with studies that take on broader investigations, as well as longitudinal studies.

On participation and learning to be a citizen. Troubling norms of identity in the performing arts

Keywords: Communities of Practice, Culture, Ethnography, Lifelong Learning

Presenting Author: Petra Weckström, Örebro Teater, Sweden, Sweden; **Co-Author:** Sangeeta Bagga-Gupta, Jönköping University, Sweden

Drawing upon ethnographical, primarily "in the wild" data from different projects within the performing arts sector, and the annual cultural-policies of Örebro County, Sweden between 2012-2020, this paper aims to describe a third position related to participation and learning by focusing on people's ways-of-being in and across policies and practices. It problematizes the audiology framed identity positions of being hearing or deaf and hard-of-hearing with the intention of unpacking socialization processes that frame people into positions of "normal" and "disabled". Thus, "natural" praxis *in situ* pertaining to the projects, including digital sites and written documents are focused upon. The study aligns itself with tenets that are framed in terms of Southern epistemologies, ontologies and methodologies, on the one hand, and presuppositions within sociocultural perspectives on learning and communication, on the other hand. It focuses on the social dimensions of collaborations that play out in peoples' lives and the nature of what is and can be meant by the label's language and identity. The findings highlight the importance of and the ways in which interpretation services shape institutional discourses, and peoples' experiences and participation across contexts. The findings point to tensions that facilitate/obstruct individuals' participation and their learning and possibilities to be citizens on an equal footing in relation to access, rights and responsibilities for all citizens. Unequal power relationships position deaf individuals in passive roles, albeit with major responsibilities and curtailed opportunities to shape their own participation including rights and responsibilities.

Session H 12

24 August 2021 12:00 - 13:00

Session Room 17

Single Paper

Motivational, Social and Affective Processes

Motivation and Emotion in Higher Education

Keywords: Educational Psychology, Emotion and Affect, Goal Orientation, Higher Education, Motivation and Emotion, Self-regulation, Teacher Professional Development

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Kristiina Mänty, University of Oulu, Finland

University Teachers' Professional Development: The Role of Achievement Goals for Learning

Keywords: Goal Orientation, Higher Education, Motivation and Emotion, Teacher Professional Development

Presenting Author: Raven Rinas, Augsburg University, Germany; **Co-Author:** Markus Dresel, University of Augsburg, Germany; **Co-Author:** Oliver Dickhäuser, University of Mannheim, Germany; **Co-Author:** Martin Daumiller, University of Augsburg, Germany

For educational success, learning is not only important for students, but also for university teachers. Professional development opportunities support university teachers in gaining the knowledge and skills necessary to implement high quality teaching practices. However, evidence suggests that some university teachers may gain more from these opportunities than others. From a motivational perspective, achievement goals, which are theorized to differentially frame emotions, cognitions, and behaviors in achievement contexts, can be considered a theoretically promising research avenue for explaining diversity in learning-related processes. The goal of the present research was therefore to examine the effects of university teachers' achievement goals on their learning engagement and learning outcomes in full-day professional development courses. To assess this, a total of 172 German university teachers completed a survey measuring their achievement goals prior to course participation, their learning engagement (effort, learning intensity, risk-taking, elaboration, implementation, and persistence) three separate times throughout the course, and their learning outcomes (learning gains and transfer intentions) after the course. Analyses revealed that university teachers' achievement goals were differentially associated with their learning engagement, with evidence of direct and mediated effects on learning outcomes. Specifically learning goals were associated with greater learning engagement and outcomes, while the opposite was found for work-avoidance goals. These results highlight the value of examining university teachers' achievement goals as a possibility to enhance professional learning experiences.

Academic Procrastination: the role of future time perspective and episodic future thinking

Keywords: Educational Psychology, Higher Education, Motivation and Emotion, Self-regulation

Presenting Author: ANDRIANA DAMIANIDOU, Aristotle University of Thessaloniki, Greece; **Co-Author:** Eleftheria Gonida, Aristotle University of Thessaloniki, Greece; **Co-Author:** Grigoris Kiosseoglou, Aristotle University of Thessaloniki, Greece

The present study focused on academic procrastination as a self-regulatory failure among university students and the predictive role of future time perspective and episodic future thinking. Specifically, the study aimed to examine the associations among academic procrastination, two aspects of future time perspective (valence and connectedness) and two aspects of episodic future thinking (autonoetic consciousness-vividness and rehearsal) in relation to three mental episodes of academic life. Positive and negative affect and self-efficacy for self-regulation were examined as mediators. A total of 671 undergraduate students attending different programs of studies were administered self-report scales measuring the variables under examination. Particularly for episodic future thinking, participants were asked to simulate three academic mental episodes (in-class oral presentation, semester exams, graduation) and respond about autonoetic consciousness- vividness and rehearsal. The three episodes were selected based on their importance and temporal proximity. Non-significant differences were found in relation to gender and to the study program. Path analysis applied for each mental episode indicated that academic procrastination was significantly predicted by future time perspective (valence and connectedness), episodic future thinking (autonoetic consciousness-vividness and rehearsal), negative affect and self-efficacy for self-regulation. Direct and indirect paths were found and differences among the path networks for the three episodes were identified.

Findings are discussed in relation to current theory for procrastination, future time perspective and episodic future thinking and implications for educational practice are pointed out.

Predicting Academic Emotions in the Learning Process Using EEG

Keywords: Emotion and Affect, Higher Education, Motivation and Emotion, Self-regulation

Presenting Author: Thomas Martens, Medical School Hamburg, Germany; **Co-Author:** Moritz Niemann, MSH Medical School Hamburg, Germany

Investigations of learning have often focused on cognitive aspects of self-regulation such as attention, planning, and goal-setting. In contrast, the research area of academic emotions stresses the important role of emotions in the context of learning. Prior studies revealed that learning processes are rich with affective states such as confusion, frustration, boredom, and curiosity. In this study, we investigated the occurrence of affective states during an introductory programming course (Python). Based on the research paradigm by Bosch and D'Mello (2017), n = 95 subjects' faces were recorded on video during the learning process. Using the Retrospective Affect Judgement Protocol, subjects reviewed their own learning process on video and were prompted to label their affective states every 15 seconds of video. EEG was recorded throughout the experiment. Retrospective affective states were used as labels for segments of EEG data. Two different analysis were performed with these label-data pairings. Firstly, a model was built that is able to predict affective states during learning significantly better than a baseline model. Secondly we built multiple classifying models to discriminate each state from each other state. Interpreting these results as a measure for state (dis)similarity, results revealed that affective states do not cluster according to their valence, but instead into Engagement and Disengagement clusters. The Engagement cluster contains emotions of both positive and negative valence. Such a model has the potential to be used in an Intelligent Tutoring System (ITS) to adapt the course according to the learner's academic emotion.

Session H 13

24 August 2021 12:00 - 13:00

Session Room 12

Single Paper

Instructional Design

Teaching and Instruction in Student Learning

Keywords: Higher Education, Instructional Design, Mathematics, Reading Comprehension, Student Learning, Teacher Professional Development, Teaching/Instruction

Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education

Chairperson: Soeharto Soeharto, University of Szeged, Doctoral School of Education, Indonesia

Fostering flexibility in equation solving by means of comparing and classroom discussions

Keywords: Mathematics, Student Learning, Teacher Professional Development, Teaching/Instruction

Presenting Author: Christian Rüede, FHNW School of Education, Switzerland; **Co-Author:** Sog Yee Mok, University of Zurich, Switzerland; **Co-Author:** Fritz C. Staub, University of Zurich, Switzerland

Comparing solution methods in laboratory studies has been shown to be a powerful tool to promote strategic flexibility in equation solving. Transferring this method successfully into classrooms, however, remains to be challenging. Two professional development programs of the same duration were developed that either focused on comparing solution methods alone, or additionally introduced the *Accountable Talk* approach for guiding productive classroom discussions on comparing solution methods. The effects of both professional development programs in comparison to a control group were tested in an experimental study ($n = 39$ teachers of upper secondary education, $k = 739$ students). At posttest, students in both experimental groups had made greater gains in procedural knowledge and strategic flexibility than students in the control group. The Accountable Talk group in addition increased their conceptual knowledge. Some significant effects in strategic flexibility were still observed 2.5 months later. We discuss implications for the design and implementation of professional development for comparing solution methods.

The role of need for cognition and specific self-explanation instructions in text comprehension

Keywords: Instructional Design, Reading Comprehension, Student Learning, Teaching/Instruction

Presenting Author: Susanne Narciss, TU Dresden, Germany; **Co-Author:** Maria Neumann, Dresden University of Technology, Germany; **Co-Author:** Antje Proské, TU Dresden, Germany

Our goal is to understand how self-explanation instructions varying in their level of specificity support text comprehension processes of middle-school students and how need for cognition (NFC) contributes to these processes. We assume that low-NFC learners profit more from a specific than from an unspecific self-explanation instruction, while for high-NFC learners the specificity level will have no impact. Seventy two students were asked to self-explain six expository science texts either with a specific or an unspecific self-explanation instruction. Six days later, text comprehension was measured via five recall and five inference questions for each text. Reading ability, prior knowledge and NFC were also assessed in this session using standardized instruments. NFC had a significant main effect on detail as well as inference question performance. A MANOVA showed a significant main effect of NFC group, but no effect of self-

explanation instruction nor a significant interaction of NFC group and condition. Results suggest NFC to affect lower- and higher-level text comprehension processes long-term in middle-school students. We suggest to further examine and discuss implications on instructional design.

Promoting Learning through Elaborated Feedback in Online Quizzes with Closed Questions

Keywords: Higher Education, Instructional Design, Student Learning, Teaching/Instruction

Presenting Author:Natalie Enders, Universität Hildesheim, Germany; **Co-Author:**Robert Gaschler, FernUniversität in Hagen, Germany; **Co-Author:**Veit Kubik, University of Bielefeld, Germany

Especially in distance learning during the ongoing Covid-19-Pandemic, providing university students with formative online quizzes is supposed to support self-regulated learning and enhance long-term retention. In the current study, the additional benefits of elaborated over corrective feedback in quizzes with closed questions for students' achievement of factual knowledge were investigated in a naturalistic online-learning environment. Data were collected in winter term 2019/20 in a moodle-based biopsychology course at the FernUniversität in Hagen, Germany. As part of a course activity, $N=496$ students participated in two quizzes. In each quiz (Session 1 and Session 2), students were tested by means of 60 true-false-items. They were supposed to judge verbal statements on the course material as "true" or "false." We manipulated feedback type and thus employed a three-factorial mixed design: *Feedback type* in Session 1 (corrective vs. elaborated) x *students' response status* in Session 1 (correct vs. incorrect solution) x self-regulated *time delay* in between sessions (1st, 2nd, 3rd-5th, vs. >5th day). The results showed that students' performance significantly increased from Session 1 to Session 2, $t(495)=29.18, p$

Session H 14

24 August 2021 12:00 - 13:00

Session Room 13

Single Paper

Learning and Instructional Technology, Motivational, Social and Affective Processes

Mathematics

Keywords: Achievement, Educational Technology, Emotion and Affect, Mathematics, Motivation and Emotion, Reading Comprehension, Secondary Education, Technology

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 08 - Motivation and Emotion

Chairperson: Sikunder Ali, Norwegian University of Science and Technology (NTNU), Norway

Teacher Feedback in Flipped Mathematics Classrooms

Keywords: Educational Technology, Mathematics, Secondary Education, Technology

Presenting Author:Mustafa Cevikbas, University of Hamburg, Germany; **Co-Author:**Gabriele Kaiser, University of Hamburg, Germany

Innovative technologies such as Flipped Classrooms (FCs) can change the perspective of mathematics teaching and provide different experiences and new ideas. In a qualitative case study, we examined the characteristics of feedback provided by a mathematics teacher in two different secondary mathematics classrooms, comparing non-FCs and FCs. The results indicated that the mathematics teacher could provide more comprehensive, diverse, and personalized feedback to her students in FCs, including explanations, hints, encouragement, support, inquiry, confirmation, or correction. Additionally, there was a notable increase in the number of provided feedback in FCs. Overall, the results are promising that mathematics teachers can enrich their feedback in flipped mathematics teaching.

Anxiety, motivation, & ability in math & reading in children with and without learning difficulties

Keywords: Achievement, Emotion and Affect, Mathematics, Reading Comprehension

Presenting Author:Courtney Pollack, Boston College, Massachusetts Institute of Technology, United States; **Co-Author:**Dayna Wilmot, Massachusetts Institute of Technology, United States; **Co-Author:**Tracy Centanni, Texas Christian University, United States; **Co-Author:**Kelly Halverson, Massachusetts Institute of Technology, United States; **Co-Author:**Andrea Imhof, University of Oregon, United States; **Co-Author:**Karolina Wade, Massachusetts Institute of Technology, United States; **Co-Author:**Rachel Romeo, Massachusetts Institute of Technology, United States; **Co-Author:**Jimmy Capella, Massachusetts Institute of Technology, United States; **Co-Author:**Isabelle Frosch, Massachusetts Institute of Technology, United States; **Co-Author:**Anila D'Mello, Massachusetts Institute of Technology, United States; **Co-Author:**Noor Al Dahhan, MGH Institute of Health Professions, United States; **Co-Author:**John D.E. Gabrieli, Massachusetts Institute of Technology, United States; **Co-Author:**Joanna Christodoulou, MGH Institute of Health Professions, United States

Knowledge of the relations among learners' motivation, anxiety, and competence as they engage in mathematics and reading is limited, especially for children who struggle with mathematics, reading, or both. This study examined the relations between competence, motivation, and anxiety in mathematics and reading, within and across academic domains, in an academically-diverse set of learners ($n = 150$). Participants completed standardized assessments of mathematics and reading, and measures of mathematics and reading motivation and anxiety. Existing measures of mathematics anxiety and reading motivation were paired with researcher-developed analogues for reading anxiety and mathematics motivation. Results showed high internal consistency for all motivation and anxiety measures. For each domain, participants with higher competence had higher motivation and lower anxiety, on average. Higher anxiety was also associated with lower motivation, on average. Results also showed a cross-domain relation: participants with higher mathematics competence had higher reading motivation and lower reading anxiety, on average. Reading competence was not related to mathematics motivation or anxiety. Results contribute to knowledge of the socio-emotional characteristics that children with and without learning difficulties engage when reading and doing mathematics. Results of a unidirectional socio-emotional link between the two domains can advance research and theory of the relations among socio-emotional characteristics and competence for academically-diverse learners.

High Achievers in Mathematics: Metacognitive, Motivational and Emotional Profiles

Keywords: Achievement, Mathematics, Motivation and Emotion, Secondary Education

Presenting Author:Dimitrios Moustakas, University of Macedonia, Greece; **Co-Author:**Eleftheria Gonida, Aristotle University of Thessaloniki, Greece

High achieving students in Mathematics are often considered as a homogeneous group, however, a series of studies suggest that they are quite diverse in many aspects. The current study investigates their diversity considering three predictors of academic achievement, namely metacognitive skills, achievement motivation and academic emotions. A sample of 492 adolescents was sourced from General and Experimental high schools for advanced learners, as well as from a summer program for academically talented students. Based on their performance on a battery of school-type mathematical tasks, 141 high achievers in Mathematics were identified. With the use of cluster analysis, 5 distinct motivational profiles emerged, characterised by Lower Motivation, Lower Expectancy, Lower Value, Higher Motivation and Higher Cost respectively, compared to the sample's mean. A series of multivariate and univariate analyses of variance revealed further differences among the 5 student profiles, regarding their metacognitive knowledge and regulation, as well as their enjoyment, pride, boredom, anxiety and shame towards Mathematics. Students with Higher Motivation appeared to have the most adaptive profile in each one of these variables, while students with Lower Motivation performed more poorly than most others. However, high achievers seemed to be quite homogeneous in terms of their metacognitive accuracy. The results also supported the qualitative equivalence between male and female high achievers, not only in the general sample but also within each cluster, in terms of their metacognitive, motivational and emotional characteristics.

Session H 15

24 August 2021 12:00 - 13:00

Session Room 18

Single Paper

Higher Education, Instructional Design, Lifelong Learning

The role of dialogue in designing for interdisciplinarity

Keywords: Argumentation, Case Studies, Collaborative Learning, Communities of Learners, Higher Education, Instructional Design, Interdisciplinary, Knowledge Creation, Lifelong Learning, Secondary Education

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Tuike Iiskala, University of Turku, Finland

Co-designing for learning across disciplines: Design principles for student-led innovation

Keywords: Collaborative Learning, Higher Education, Interdisciplinary, Knowledge Creation

Presenting Author: Lina Markauskaite, University of Sydney, Australia; **Co-Author:** Dwayne Ripley, The University of Sydney, Australia; **Co-Author:** Natasha Arthars, The University of Sydney, Australia; **Co-Author:** Maryam Khosronejad, The University of Sydney, Australia

Universities increasingly introduce diverse project-based interdisciplinary courses in which students learn to solve problems that span across disciplines and ways of knowing. However, how to design for productive student learning across disciplinary boundaries is little understood. Students and teachers' perspectives are usually missing from design decisions. In this paper, we aim to contribute to new approaches and principles for designing interdisciplinary courses. We report on a participatory co-design study in which university students and faculty co-created a course for developing students' capabilities to work on interdisciplinary innovation-oriented research projects. Our main research question is: What are the critical design aspects of a jointly co-constructed innovation-oriented interdisciplinary course? Initially, we describe a relational design approach that we adopted for co-designing the course to enable equitable student and faculty engagement in the joint dialogue and generation of actionable design ideas. Then, we present design principles that emerged from a series of design thinking workshops. The co-created design principles placed a high value on students' epistemic and social agency and their potential to engage in authentic open-ended knowledge work that has real-world application. However, these principles also reflected a tension between students' autonomy and a need for ongoing guidance. Course flexibility, transparency and ongoing students and teachers' dialogue about course design were viewed as essential for success. These results challenge traditional approaches to course design which aim to pre-design courses in advance, suggesting that the open-ended nature of interdisciplinary learning requires adopting more flexible developmental co-design approaches.

Knowledge integration and coordination of collaboration in interdisciplinary learning design teams

Keywords: Case Studies, Communities of Learners, Interdisciplinary, Lifelong Learning

Presenting Author: Carol Rodrigues, University of Oslo, Faculty of Education, Norway; **Presenting Author:** Crina Damsa, University of Oslo, Norway; **Co-Author:** Greta Björk Gudmundsdóttir, University of Oslo, Norway; **Co-Author:** Hanna Ragnarsdóttir, University of Iceland School of Education, Iceland

This contribution presents a study of interdisciplinary collaboration in a team of academics, teachers and professional experts, who worked together to design an online course in intercultural competence. Interdisciplinary collaboration has been extensively studied in research contexts, but little is known about how academics in interdisciplinary teams engage in collaborative learning design work. This study explored the strategies an interdisciplinary project team employed to engage in knowledge integration, and their reported experiences and challenges during their participation in the interdisciplinary work. The empirical context was a European development project, with partners from the Nordic and Baltic countries. Data consisted of individual interviews, discussions from project meeting and produced course materials. A combined framework based on the notions of modes of interdisciplinary and academic hospitality was employed to interpret data analysed through thematic and qualitative content analysis. The findings reveal that academics engaged in knowledge sharing but also questioned and critically reflected on each other's perspectives. Knowledge negotiations were seen as a crucial aspect of the collaborative design process, where both disciplinary knowledge and knowledge of design need to be articulated. Barriers in linguistic proficiency and alleged power dynamics shaped discussions. The study highlights implications for both research and practice. Mutual feedback, critically analyse and reflection on each other's perspectives and ideas and space to augment team expertise are crucial for the development of interdisciplinary product. Forbearance, openness and flexibility, and a democratic approach in the discussions, are pointed out as needed when organizing collaboration in interdisciplinary teams.

Interdisciplinarity and school-learning in schools that comply with dialogic pedagogies

Keywords: Argumentation, Instructional Design, Interdisciplinary, Secondary Education

Presenting Author: Baruch Schwarz, Hebrew University of Jerusalem, Israel; **Co-Author:** Einat Heyd-Metzuyanim, The Technion Israel Institute of Technology, Israel; **Co-Author:** Boris Koichu, Weizmann Institute of Science, Rehovot, ISRAEL, Israel; **Co-Author:** Michal Tabach, Tel Aviv University, Israel; **Co-Author:** Anat Yarden The Weizmann Institute of Science, Weizmann Institute of Science, Israel

In spite of the profusion of interdisciplinary programs, research on interdisciplinary cognition is missing. We undertake an analysis of core construct categories (Goldman et al., 2016) of three disciplines – Mathematics, Science, and Philosophy. For these three disciplines, we compare the core construct categories for experts in these disciplines, and in classrooms in which traditional vs. progressive pedagogies (or dialogic pedagogies) are enacted. The analysis shows that disciplines are distinct according to all core construct categories – (a) epistemologies, (b) inquiry practices and reasoning strategies, (c) overarching concepts and frameworks, (d) types of texts in which information is represented and expressed, and (e) discourse, language and structures. We show that the compartmentalization is of a different nature in classrooms in which traditional vs. dialogic pedagogies are enacted. We also show that in classrooms in which dialogic pedagogies are enacted, the core categories are more similar to those present in the activity of the experts, and that the walls between disciplines are lowered. We argue that the enactment of dialogic pedagogies opens opportunities for the emergence of interdisciplinary processes. However, we list the challenges that educators face in interdisciplinary programs. We describe a three-year long interdisciplinary program we initiated, in which we investigate ways to overcome these challenges.

Session H 16

24 August 2021 12:00 - 13:00

Session Room 15

Invited Symposium

Motivational, Social and Affective Processes

EFG: The Potential of Biophysiology to Understand Motivation, Engagement and Learning Experiences

Keywords: Assessment Methods and Tools, Educational Psychology, Emotion and Affect, Higher Education, Motivation and Emotion, Primary Education, Secondary Education

Interest group:

Chairperson: Tim Mainhard, Utrecht University, Netherlands

Discussant: Tim Mainhard, Utrecht University, Netherlands

In this Early Emerging Field Group, we explore the role of biophysiology (e.g., heart rate, cortisol, electrodermal activity, physical activity and rest) in students' and teachers' motivation, engagement, and learning experiences. Augmenting more traditional psycho-educational research approaches with biophysiological measures will enable us to focus on how "mind" and "body" function in interplay in educational contexts and can provide insight into processes as they unfold. With growing evidence for biophysiological interventions, these insights have significant potential for educational practice. In this symposium we present three presentations representing three themes: 1: Physiological arousal (e.g., heart rate variability); 2) Physical activity/rest (e.g., accelerometer activity); and 3) Physiological stress (e.g., cortisol) and its role in understanding students' and teachers' motivation, engagement, and learning experiences. The presenters of this session contributed to our symposium series funded by the Jacobs Foundation (see <https://earli.org/efg-02> for summary of our activities). This 4-part symposium series, held at Universities of Utrecht (2019), Oxford (2019), Jyväskylä (2020) and forthcoming in Padua (2021), offered a wealth of cutting-edge research that combined educational and biophysiological perspectives, contributing to our understanding of the motivation, engagement, and learning experiences of students and teachers.

Can You Feel the Excitement? The Physiological Correlates of Students' Self-reported Experiences

Presenting Author: Reito Visajaani Salonen, University of Helsinki, Finland; **Co-Author:** Elina E. Ketonen, University of Helsinki, Finland; **Co-Author:** Kirsti Lonka, University of Helsinki, Finland; **Co-Author:** Katriina Salmela-Aro, Helsinki University, Finland

This study explored the bio physiological correlates of students' self-reported experiences by combining bio signal data with experience sampling method (ESM) data. We investigated the extent to which students' self-reported experiences (measured by ESM) and associated physiological responses (e.g., heart rate activity, assessed continuously by wearable biometric sensors) would manifest in students' daily life. For instance, we examined whether self-reported motivational state of excitement would predict students' heart rate (HR) and heart rate variability (HRV) within the moment. Participants' physical activity was controlled in the models via metabolic equivalent of task (MET) values (actigraphy data). As part of the study, we explored methods to combine these different datasets. The study comprised 134 high school students. During three consecutive days, students wore biometric sensors and wristbands collecting their HR, HRV and MET signals, and answered the ESM questionnaires five times a day via smartphones. During the data processing, we needed to determine the optimal timeslot to use with ESM-data in order to combine different datasets and we discuss how different sampling rates related had their own specific methodological challenges. The empirical findings showed that, controlling for MET values, self-reported excitement predicted higher HR as well as lower HRV (indicating activation of sympathetic nervous system). Thus, combining experience sampling approach with biophysiological measures revealed how mind and body function in interplay and can therefore provide objective evidence of motivational processes as they unfold in students' daily life.

The effect of physical activity in primary school on classroom behaviour and learning experiences

Presenting Author: Christina Heemskerk, University of Bern, Switzerland; **Co-Author:** Lars-Erik Malmberg, University of Oxford, United Kingdom; **Co-Author:** Steve Strand, University of Oxford, United Kingdom

Aim: Investigate the relationship between physical activity (PA), self-reported learning experiences, and learning behaviour. Background: PA breaks can improve on-task behaviour in primary schools. PA during physical education (PE) lessons may influence children's classroom behaviour and learning experiences. Sample: 101 children (Mage 9.3, SD 0.6, 60 females) took part in this intervention. Method: Participants reported learning experiences (enjoyment, difficulty, tiredness, positive and negative affect) once a week for six weeks. Self-reports were completed at the start, middle, and end of two classroom lessons, separated by a PE lesson. Participants' task behaviour was observed during classroom lessons. Accelerometers were worn for 24h leading up to every session. We used multilevel SEM to analyse intra- and inter-individual differences in behaviour, learning experiences, and PA. Results: Inter- and intra-individual factors differentially affected children's learning experiences and behaviour. Light, moderate, and vigorous PA during PE lessons influenced subsequent learning experiences and behaviour. Regularly active children found PE less tiring and more enjoyable, and reported less classroom tiredness. Situational fluctuations in PA, learning experiences, and behaviour were recorded. Self-reported tiredness influenced classroom behaviour. BMI z-score, sex, and year group predicted task behaviour and enjoyment of lessons. Conclusion: PE can be a tool to increase pupils' on-task behaviour. Acute PA influences behaviour both directly and indirectly through experienced positive and negative affect, enjoyment, and tiredness. Moreover, when children are regularly active, it alters their learning experiences in school; they perceive less tiredness and more enjoyment.

The dynamic experience of taking an exam: Ever changing cortisol and confidence

Presenting Author: Jenefer Husman, University of Oregon, United States; **Co-Author:** Matthew Graham, University of Oregon, United States; **Co-Author:** Idalis Villanueva, Department of Engineering Education, University of Florida, United States; **Co-Author:** Darcie Christensen, Department of Engineering Education, College of Engineering, Utah State University, United States; **Co-Author:** Reinhard Pekrun, Ludwig-Maximilians-Universität, Germany

This study examined the relation between changes in students' feelings of confidence and change in sympathetic stress (as measured by salivary cortisol) during an authentic testing setting. Exams are frequent, consequential, and often stressful experiences for students in educational settings. Students' experience of stress during examination periods can negatively impact their working memory and hinder the retrieval and processing of learned information. This may in turn be detrimental to academic performance. We observed negative linear change in students' confidence, suggesting students' confidence decreased during the test. We observed U-shaped quadratic change in cortisol during the exam with students declining in cortisol from a pre-exam arousal state, attenuated by a significant positive quadratic term. We found no relation between initial level of confidence and cortisol, but found that change in confidence positively related to initial level and quadratic change in cortisol and negatively to linear change in cortisol. Students who experienced a greater declination in confidence during the exam experienced less of a recovery from pre-exam arousal in salivary cortisol. These findings suggest that there is an important relation between changes in students' self-beliefs during examinations and their experience of stress during the task. These findings highlight the utility of biological measures as an objective measure of students' stress response in academic settings and importance of attending to these affective states during exams.

Session I 1

24 August 2021 15:45 - 16:45

Session Room 7

Roundtable

Cognitive Science, Learning and Social Interaction

Primary Education

Keywords: Case Studies, Conceptual Change, Cooperative/Collaborative Learning, Educational Psychology, Misconceptions, Peer Interaction, Primary Education, Qualitative Methods, Video Analysis

Interest group: SIG 03 - Conceptual Change, SIG 10 - Social Interaction in Learning and Instruction, SIG 12 - Writing

Chairperson: Kerry Lee, The Education University of Hong Kong, Hong Kong

"I can do this as well as you!" – Peers in mixed-age classes construct commonality and difference

Keywords: Cooperative/Collaborative Learning, Peer Interaction, Primary Education, Video Analysis

Presenting Author: Tina Walther, Technische Universitaet Dresden, Germany

Situations of working together offer children the opportunity to learn with each other and from each other, both academically and socially. In mixed-age classes, working together is of high significance with respect to the recognition and appreciation of differences, and when dealing with heterogeneity. The research focus regarding cooperation in mixed-age classes has so far been rather on the (age) differences between the children and the influence on academic exchange. This paper extends the analytical perspective to include the aspect of the construction of commonality and its significance for shaping peer relations. In the dissertation project, from a practical-theoretical perspective, commonality and differences are assumed to be quasi-relational constructs, which only appear and reveal themselves during the interaction process. The research question of how primary school children of different age groups create commonality and differences when working together is explored on the basis of video analysis, following the grounded theory methodology as a combination of coding, sequence-analytical reconstruction and cross-case contrasting. The analysis of video data allows to microscopically retrace not only the verbal language but also physical and material interactions. In the round table session and based on selected video data, showing a younger and an older child working together on tasks, I would like to explore the role of language, body and objects in constructing commonality and differences.

Learning through writing in school - phenomenological study of creative experiences

Keywords: Case Studies, Primary Education, Qualitative Methods, Video Analysis

Presenting Author: Franziska Herrmann, Technische Universitaet Dresden, Germany

Writing in school serves not only the enculturation in our literate society, but also aids learning through writing. While the focus of didactic research on learning processes in writing has been on the *acquisition of knowledge* up until now, this paper will consider the *experience* of learning through writing from a phenomenological perspective. This dissertation investigates to what extent "creative experiences" show up at the creative writing of elementary school children,

which not only produce texts of special quality, but also bring about changes in the child through the process of writing. For this purpose, diverse and extensive data was collected as part of writing workshops at the *Primary Education Research Labat* TU Dresden (including children's texts, video data, interviews), which are being analyzed with the aim of phenomenological descriptiveness in the style of *Vignette Research* (Schraatz et al., 2012). The round table session will exemplify initial findings from the ongoing study in order to engage in conversation about the importance of "creative experiences" for the future of school-based learning and writing.

Computing-related Pre-conceptions of Primary School Children: Initial Insights from a Pre-study

Keywords: Conceptual Change, Educational Psychology, Misconceptions, Primary Education

Presenting Author: Cyril Brom, Charles University, Czech Republic; **Co-Author:** Tereza Hannemann, Charles University, Czech Republic; **Co-Author:** Anna Drobná, Charles University, Czech Republic; **Co-Author:** Kristina Volná, Czech Television, Czech Republic

Primary-level computing curricula are being revamped in many countries in order to foster programming skills. However, little attention is given in schools to the topics of how computing devices and the internet work. Little is known about what pre-conceptions primary school children have about basic computing-related concepts, including the data storage and data size, computer code, the internet, and computer viruses and antiviruses. Almost nothing is known about which of these pre-conceptions are resistant to change; i.e., what concepts are difficult to understand and what concepts are easy. As part of a larger project on creation of an educational, animated series for children on how computers work, we have started to map these pre-conceptions among 2-5-graders and examine difficulty in acquiring scientifically normative, age-appropriate understanding of the respective concepts. As the first step, we explored this issue in an informal way in 27 classes in the Czech Republic. So far, we have got the following initial insights: a) there is a large degree of heterogeneity in levels of understanding among children; b) children's understanding is often incomplete and fragmented; c) a recurring misconception is that Internet is located on the child's device, and this misconception is resistant to change; d) some children have no notion of data size, but this notion appears to be teachable easily; e) the ideas that computers do not have brain and programs are controlled by a program code appear to be easily graspable. This proposal includes discussion of our theoretical underpinnings and the next steps.

Session I 2

24 August 2021 15:45 - 16:45

Session Room 17

Roundtable

Learning and Special Education, Motivational, Social and Affective Processes, Teaching and Teacher Education

Motivation

Keywords: Assessment Methods and Tools, Integrated Learning, Learning and Developmental Difficulties, Motivation, Pre-service Teacher Education, Secondary Data Analysis, Social Aspects of Learning and Teaching, Social Interaction, Special Education, Teacher Professional Development

Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Bernhard Standl, Germany

Engagement as a collective process

Keywords: Motivation, Secondary Data Analysis, Social Aspects of Learning and Teaching, Social Interaction

Presenting Author: Mayra Mascareño Lara, University of Groningen, Netherlands; **Co-Author:** Naomi de Ruiter, University of Groningen, Netherlands; **Co-Author:** Elisa Kupers, University of Groningen, Netherlands

Student engagement is crucial to learning processes and outcomes. Engagement is typically operationalized as an individual process influenced by the social learning environment. However, intuitively, one can recognize that a group of students can be engaged or disengaged as a collective. This round table is embedded in a research project in which we attempt to advance the definitions and operationalizations of engagement as a group process, or collective engagement, as well as to identify the mechanisms for the emergence and management of collective engagement in secondary education classrooms. The current phase of this project involves a literature review of the construct of collective engagement. In this round table presentation we put the construct of collective engagement up for discussion. This discussion will feedback our research process so as to achieve a good coverage of the literature on collective engagement and adjacent constructs, and ultimately it will contribute in the refinement of definitions and operationalizations of collective engagement.

Investigating the relation between teachers' professional vision and their motivating style

Keywords: Assessment Methods and Tools, Motivation, Pre-service Teacher Education, Teacher Professional Development

Presenting Author: Nele Van Doren, University of Ghent, Belgium; **Co-Author:** Ruben Vanderlinde, Ghent University, Belgium; **Co-Author:** Katrien De Cocker, Ghent University, Belgium; **Co-Author:** Leen Haerens, Ghent University, Belgium

Studies stemming from Self-Determination Theory reveal that teachers' motivating style impacts crucial students' and teachers' outcomes such as students' motivation, well-being, and learning results, and teachers job-related stress, burnout and drop-out. Furthermore, a teachers' capability to motivate their students is a key competence as it also influences other generic teaching competences like instruction, assessment and classroom management. To measure teachers' motivating style, Aelterman and colleagues developed the Situation in School questionnaire. In this questionnaire teachers respond on how they react to specific situations that happen in the classroom. To effectively motivate their students, it is imperative that teachers not only notice crucial classroom events (i.e. noticing), but also that they select the most motivating strategies to deal with the situation at hand (i.e. after reasoning). In this context, the concept of professional vision is interesting, as it contains two components: 'noticing' and 'knowledge-based reasoning'. Research on professional vision has only more recently focused on generic teaching competencies (e.g. instruction, classroom management). During the roundtable my research project will be presented, which aims to investigate the relation between professional vision regarding motivating teaching, and teachers' actual motivating style. To reach this aim, a video-based assessment tool to measure teachers professional vision related to teachers' motivating style will be developed.

Effectiveness of Reader's Theater programs in promoting reading skills and motivation

Keywords: Integrated Learning, Learning and Developmental Difficulties, Motivation, Special Education

Presenting Author: Jarkko Hautala, Niilo Mäki Institute, Finland; **Co-Author:** Miia Ronimus, Niilo Mäki Institute, Finland; **Co-Author:** Enni Junttila, Niilo Mäki Institute, Finland

In Reader's Theater (RT), reading fluency is practiced by repeated reading of short theater scripts, providing also an opportunity to learn expressive reading and drama skills such as role taking and public performing. A goal to perform a play for an audience may increase the effectiveness of RT, but this has not been previously researched. We studied the effectiveness of two RT programs (8 weekly 90-minute sessions) on the reading skills and motivation of dysfluent readers from Grades 3 and 4 ($N = 160$). One program included the goal to perform a play to an audience (RT Goal), while the other did not have such a goal (RT Practice). A reading fluency -matched control group received an equal amount of business-as-usual support including repeated reading exercises. A large group ($N = 162$) of typically reading students was also included. Pretest, posttest and 6-month follow-up assessments included measures of reading fluency, expressive reading, reading comprehension, self-efficacy, self-determination, emotions, and recreational reading. Analyses of the pre- and posttest data indicated that the reading skills of the RT and control groups developed at a similar rate, which was equal or higher in comparison to the typical reader group. These results suggest that the support was adequate, and that RT is equally effective with traditional high quality reading instruction. In motivational measures, RT Goal group showed higher engagement in RT, and improved self-efficacy in public performance. These results indicate that implementing RT projects in the context of special education is a promising approach.

Session I 3

24 August 2021 15:45 - 16:45

Session Room 4

Roundtable

Cognitive Science, Motivational, Social and Affective Processes

Learning and Instruction

Keywords: Biology, Cognitive Skills, Computer-supported Collaborative Learning, Content Analysis, E-Learning/Online Learning, Educational Psychology, Motivation and Emotion, Multimedia Learning, Peer Interaction, Qualitative Methods, Reading Comprehension, Self-regulation

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 16 - Metacognition

Chairperson: Birgit Hepp, Humboldt-Universität zu Berlin , Germany

Learning from Multiple Illustrated Texts about COVID-19

Keywords: Biology, Cognitive Skills, Multimedia Learning, Reading Comprehension

Presenting Author:Jennifer Cromley, University of Illinois at Urbana-Champaign, United States; **Co-Author:**Andrea Kunze, University of Illinois at Urbana-Champaign, United States

We gathered data on 30 undergraduate biology students reading two sets of illustrated texts about COVID-19 and the immune system. Merging principles from the multi-text comprehension and multimedia learning (van Meter et al., 2020) literatures, we presented sets of 4 complementary texts. We expected the first page in a complementary text set to be particularly important for posttest integrative inferential scores, since later pages build on new information on the first page. We find that the first page is indeed most important, that participants' knowledge increased after passage set 1, integrative inferential scores are significantly related to prior knowledge, and participants scored better from the first text set that had more explicit causal language.

Intraindividual dynamics of interest development

Keywords: Content Analysis, Educational Psychology, Motivation and Emotion, Qualitative Methods

Presenting Author:Jael Draijer, University Utrecht, Netherlands; **Co-Author:**Larike Bronkhorst, Utrecht University, Netherlands; **Co-Author:**Sanne Akkerman, Utrecht University, Netherlands

Interest research is often focused on one interest in one context (e.g. interest in mathematics within the mathematics class) which yields an incomplete picture of interest development. Adolescents pursue multiple interests within their daily lives (Hofer, 2010), which implies that one's interests are relative to one another and develop in parallel. One may experience competition between interests in terms of time and resources, and interests may over time intertwine and be integrated (Akkerman & Bakker, 2019; Azevedo, 2011; Krapp, 2002). The current study aims to explore these intrapersonal dynamics in interests: How do adolescents make sense of their interest-driven engagements in relation to one another? Fifty-one adolescents of different educational tracks were interviewed twice about the time they spend on their interests and the way they make sense of developments in their interests. In between the interviews, adolescents reported on their interests during three intermittent weeks four months apart, using an Experience Sampling Method (ESM) implemented in a smartphone application. Preliminary findings show how interests can compete when they have similar purposes in someone's life, or can alternatively complement and support each other. Further findings are discussed and interpreted during the round table. More knowledge about intrapersonal interest dynamics can enrich theory on interest development: studying an interest in relation to the adolescent's whole life yields a broader understanding of the value and development of the interest than studying it in isolation, for example in the context of declining STEM interest (e.g. Potvin & Hasni, 2014).

Facilitating Peer-Learning in Computer Mediated Foreign Language Learning

Keywords: Computer-supported Collaborative Learning, E-Learning/Online Learning, Peer Interaction, Self-regulation

Presenting Author:Kateryna Holubinka, FernUni Hagen, Germany, Germany

The purpose of the present study is to investigate the effectiveness of integrating peer-learning components in online learning environments, as well as define best practices for online peer-learning environments. To fulfill this, a web-based interactive peer-learning environment was created based on the content of an existing language learning platform ALTISSIA, enriched with peer-learning activities to match the language learners of similar levels from different cultural backgrounds. The course design is based on the principles of the Community of Inquiry framework, and Self-Determination theory and explicitly incorporates meta-cognitive, motivational and self-regulatory strategies. Although current research project is based on a true experimental design within a mixed methods research, the present paper will focus on the reflection of qualitative data collected throughout iterative prototype development with extensive testing, evaluation and improvement. Current findings have shown that incorporating a peer-learning format can boost motivation and emotional engagement of the learners, which has the potential to maximize the practice time, increase information retention, and improve learning outcomes and satisfaction rates. These findings can be applied in the course design of scalable online and face-to-face learning environments.

Session I 4

24 August 2021 15:45 - 16:45

Session Room 18

Collaborative Workspace

Instructional Design

Didactical Design in Classroom Research: Establishing a multidisciplinary approach to DBR

Keywords: Action Research, Design-based Research, Meta-analysis, Teaching/Instruction

Interest group:

*Design-Based Research (DBR)*is a promising research approach integrating educational theory and practice. The initiation of*Didactical Design in Classroom research group (DDC)* aims to gather researchers of diverse subjects and disciplines to exchange methodological and theoretical experiences of conducting DBR around didactical approaches to classroom research. The goal is to establish a globally attractive interdisciplinary research hub of expertise and data based on conceptually and methodologically critical and reflective research practice. This collaborative space will involve a discussion of both qualitative and quantitative research methods to study the consequences of DDC interventions for students, teachers and broader educational claims. This is expected to lead to collaborative activities and research such as international webinars, joint teaching in doctoral courses, symposium at conferences and plans for future writing proposals for national and international funding agencies.

Didactical Design in Classroom Research: Establishing a multidisciplinary approach to DBR

Presenting Author:Sylvana Sofkova Hashemi, University of Gothenburg; Halmstad University, Sweden; **Co-Author:**Eva Nyberg, University of Gothenburg, Sweden; **Co-Author:**Peter Nyström, University of Gothenburg, Sweden; **Co-Author:**Ali Yildirim, University of Gothenburg, Sweden

*Design-Based Research (DBR)*is a promising research approach integrating educational theory and practice. The initiation of*Didactical Design in Classroom research group (DDC)* aims to gather researchers of diverse subjects and disciplines to exchange methodological and theoretical experiences of conducting DBR around didactical approaches to classroom research. The goal is to establish a globally attractive interdisciplinary research hub of expertise and data based on conceptually and methodologically critical and reflective research practice. This collaborative space will involve a discussion of both qualitative and quantitative research methods to study the consequences of DDC interventions for students, teachers and broader educational claims. This is expected to lead to collaborative activities and research such as international webinars, joint teaching in doctoral courses, symposium at conferences and plans for future writing proposals for national and international funding agencies.

Session I 5

24 August 2021 15:45 - 16:45

Session Room 6
Collaborative Workspace
Teaching and Teacher Education

Research on Using Virtual Reality to Augment STEM Teachers' Promotion of Self-Regulation

Keywords: Science Education, Self-regulation, Teaching/Instruction, Technology
Interest group: SIG 16 - Metacognition

As a group of five international researchers (from US, Finland, Germany, Israel and Turkey), we will be opening up for discussion our joint effort for developing a unified interdisciplinary research agenda focused on the ways in which immersive systems such as extended reality (XR), virtual reality (VR), augmented reality (AR), and mixed reality (MR) can be used in a number of innovative ways to understand, measure, train, teach, and learn about self-regulation (focusing on metacognition) across both (human and artificial) teachers and learners in STEM learning environments. This research collaboration will start with a pilot study on preservice science teachers' perceptions about learning (and teaching with) virtual reality in STEM. The research group will then use pandemic-adjusted methods for conducting research on how preservice and inservice teachers use XR-based systems for extending the learning of students as well as supporting the development of their SRL. This session, co-led by our group of international researchers, will involve discussion with audience members on aims of the research collaboration, a theoretical discussion of SRL, a brief overview of our mixed-method international study, challenges associated with the use and analysis of various data types, and implications of our results for designing intelligent XR-based systems for teaching teachers' about SRL.

Research on Using Virtual Reality to Augment STEM Teachers' Promotion of Self-Regulation

Presenting Author: Engin Ader, Boğaziçi University, Turkey; **Co-Author:** Roger Azevedo, University of Central Florida, United States; **Co-Author:** Sanna Järvelä, University of Oulu, Finland; **Co-Author:** Alexander Groeschner, Friedrich Schiller University Jena, Germany; **Co-Author:** Tova Michalsky, Bar Ilan University, Israel

As a group of five international researchers (from US, Finland, Germany, Israel and Turkey), we will be opening up for discussion our joint effort for developing a unified interdisciplinary research agenda focused on the ways in which immersive systems such as extended reality (XR), virtual reality (VR), augmented reality (AR), and mixed reality (MR) can be used in a number of innovative ways to understand, measure, train, teach, and learn about self-regulation (focusing on metacognition) across both (human and artificial) teachers and learners in STEM learning environments. This research collaboration will start with a pilot study on preservice science teachers' perceptions about learning (and teaching with) virtual reality in STEM. The research group will then use pandemic-adjusted methods for conducting research on how preservice and inservice teachers use XR-based systems for extending the learning of students as well as supporting the development of their SRL. This session, co-led by our group of international researchers, will involve discussion with audience members on aims of the research collaboration, a theoretical discussion of SRL, a brief overview of our mixed-method international study, challenges associated with the use and analysis of various data types, and implications of our results for designing intelligent XR-based systems for teaching teachers' about SRL.

Session I 6

24 August 2021 15:45 - 16:45

Session Room 11
Single Paper
Teaching and Teacher Education

Teacher Professional Development and Qualitative Methods

Keywords: Collaborative Learning, Communities of Practice, Cultural Psychology, Educational Psychology, Emotion and Affect, Qualitative Methods, Quantitative Methods, Teacher Professional Development

Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Diego Osvaldo Camacho Vega, Mexico

Characteristics of Teachers' Professional Communication about Teaching (PCT) – a Systematic Review

Keywords: Collaborative Learning, Communities of Practice, Qualitative Methods, Teacher Professional Development

Presenting Author: Christian Schadt, University of Hohenheim, Germany; **Co-Author:** Julia Warwas, Universität Hohenheim, Germany

The cfp for EARLI's 2021 conference designates the "formation of skills to share and commonly create knowledge" as one of the most important outcomes of learning and thus, an essential research topic. This statement not only applies to students but also to their teachers, as empirical evidence shows that collaboration and knowledge sharing among teachers contributes to their professional development (for an overview, Vangrieken et al. 2017). Although *communication* is one of the most important factors of successful collaboration among teachers (e.g. Horn & Kane 2015), it is also a conceptually vague term in the related literature and even discussed controversially regarding which aspects of communication are particularly conducive to enhance teachers' professional knowledge and skills (cf. Vescio 2020). Therefore, we conducted a systematic literature review to elicit (a) observational measures of successful communication among teachers in extant empirical studies and (b) the theoretical underpinnings of these measures. By analyzing 88 papers that were identified through a rigorous search strategy in four databases, we derive distinctive descriptive categories of professional communication about teaching (PCT) that are both theoretically justified and empirically associated with indicators of the participants' professional development. We found 6 different ways of theoretically embedding PCT. Furthermore, we classified the observational measures that could be identified as characteristics of successful communication with regard to the *process* of communicating (i.e. discourse norms and structure of the communication process) as well as *quality* of communicating (i.e. level of elaboration).

How narrative structure may foster teacher resilience: a qualitative analysis of two cases

Keywords: Cultural Psychology, Emotion and Affect, Qualitative Methods, Teacher Professional Development

Presenting Author: Marc Clarà, University of Lleida, Spain; **Co-Author:** Alba Vallés, University of Lleida, Spain; **Co-Author:** Aina Franch, University of Lleida, Spain; **Co-Author:** Jordi Coiduras, University of Lleida, Spain; **Co-Author:** Patricia Silva, University of Lleida, Spain; **Co-Author:** Silvia Cavalcante, University of Lleida, Spain

This study seeks to understand how certain narrative structures, used by teachers to make sense of the situations of their practice, may foster teacher resilience. We qualitatively analyzed the narratives of two teachers who, although working at the same school and teaching the same subject to children of the same age, showed very different levels of emotional exhaustion. We conducted an analysis based on structural semantics and identified important structural differences between the two narratives. The core structure of the narrative of the teacher with higher emotional exhaustion was based on a contradiction between the teacher's aim and the others' actions; in contrast, the core structure of the narrative of the teacher with lower emotional exhaustion was based on the hybridization of the teacher's aim and the others' actions. We argue that this difference may explain the differences in emotional exhaustion between the two teachers, and that the hybridization narrative structure may foster teacher resilience. This has important implications for teacher education, since it suggests that the process of narrativization of experience is crucial for teacher resilience; accordingly, opportunities and support should be provided for student teachers to narrativize their educational experience through "healthy" narrative structures.

Diversity and systematics of data-based intervention decisions in early education Mathematics

Keywords: Educational Psychology, Qualitative Methods, Quantitative Methods, Teacher Professional Development

Presenting Author: Nicole Reinsdorf, Universität Potsdam, Germany; **Co-Author:** Miriam Balt, Leibniz Universität Hannover, Germany; **Co-Author:** Antje Ehrlert, University of Potsdam / University of Johannesburg, Germany

The results of international school performance studies such as PISA and TIMSS and the implementation of nationwide comparative studies call on teachers to evaluate their teaching activities on the basis of empirical data. The implementation study presented here introduces determining factors that show the diversity and systematics of implementing data-based feedback for instructional decision making in a scientifically accompanied project. For the initial mathematical

education, the core elements of the Response-to-Intervention approach (RTI) were implemented in two primary schools based on an experimental control group design with pre-post and progress testing. In order to obtain representative factors, qualitative and quantitative data from two sub-studies of the implementation study were combined in a mixed-method approach. The focus of the analysis is the structuring qualitative content analysis according to (Kuckartz, 2018). The factors analysed from the cooperation protocols of the team meetings represent the central decisions of the teachers when deviating from the scientific results. The results show that more than one third of the children were not encouraged or challenged in their initial lessons on mathematics.

Session I 7

24 August 2021 15:45 - 16:45

Session Room 10

Single Paper

Assessment and Evaluation, Motivational, Social and Affective Processes

Assessment Methods, Attitudes and Beliefs

Keywords: Assessment Methods and Tools, At-risk Students, Attitudes and Beliefs, Game-based Learning, Learning Technologies, Parental Involvement in Learning, Reading Comprehension, Survey Research

Interest group: SIG 01 - Assessment and Evaluation, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Juuso Henrik Nieminen, University of Eastern Finland, Finland

Mindset Moderates Healthcare Providers' Performance in a Neonatal Resuscitation Simulator

Keywords: Assessment Methods and Tools, Attitudes and Beliefs, Game-based Learning, Learning Technologies

Presenting Author: Chang Lu, University of Alberta, Canada; **Co-Author:** Simran Ghoman, University of Alberta, Canada; **Co-Author:** Maria Cutumisu, University of Alberta, Canada; **Co-Author:** Georg Schmoelzer, University of Alberta, Canada

Simulation education can benefit healthcare providers (HCPs) by providing opportunities to practice the high-acuity, low-occurrence neonatal resuscitation tasks in low-stakes environments. However, few studies investigated the role of growth mindset on HCPs' longitudinal neonatal resuscitation performance before and after simulation-based training. This study examines whether the RETAIN digital and table-top simulators effectively facilitate HCPs with neonatal resuscitation knowledge gain, retention, and transfer; and whether growth mindset moderates HCPs' longitudinal performance in neonatal resuscitation. Participants were n=50 HCPs affiliated with a tertiary perinatal centre in Canada. This longitudinal study included a pre-test and a mindset survey, immediately followed by a post-test using the RETAIN digital simulator, and two post-tests after two and five months using the RETAIN digital and table-top simulator, respectively. General Linear Mixed Model repeated-measures were employed to observe HCPs' performance over time, and to scrutinize the moderating effect of growth mindset on the association between test-time points and performance. Results revealed that, compared with their pre-test performance, HCPs effectively improved their neonatal resuscitation knowledge after the simulation-based training on the immediate post-test ($F_{1,14}=1.88$, p)

A German Digital Reading Test for Grades 3 to 4: Development and Piloting

Keywords: Assessment Methods and Tools, At-risk Students, Learning Technologies, Reading Comprehension

Presenting Author: Susanne Seifert, University of Graz, Austria; **Co-Author:** Lisa Paleczek, University of Graz, Austria

To adequately support each student in reading lessons, it is necessary to assess their reading skills. Using digital assessments can support teachers in the process of (repeated) assessment, especially when preparing, conducting, evaluating and documenting assessments. A digital assessment tool focusing on assessing reading comprehension skills in Grades 3 and 4 is currently being developed in Austria. This reading assessment covers three domains referring to reading comprehension (word-, sentence- and text-level). Text-level is assessed via two subtests (Subtest I: presentation of nonsense-stories and corresponding questions, and Subtest II: maze selection). The other levels consist of one subtest each. This paper focusses on two studies. Study 1 (data collection: 10/2019-12/2019) aimed at the development of the digital reading test and the item analysis (N= 273 students; Grade 3: N=117; Grade 4: N=156). The final version of the test after item selection shows satisfactory values for internal consistency (word: $\alpha=.91$, sentence: $\alpha=.81$, text I: $\alpha=.87$, text II: as four items needed to be revised, the internal consistency will be provided after Study 2). Study 2 (data collection: 09/2020-11/2020) analyses the reliability and validity measures of the digital reading assessment (N=550 students, Grade 3: N=333; Grade 4: N=217). The results are discussed in the light of teachers' needs for and assets and challenges of standardized digital assessments to ease identification of students needing tailored support in reading.

Parent' perceptions and beliefs of assessment in Finnish basic education: A large-scale study

Keywords: Assessment Methods and Tools, Attitudes and Beliefs, Parental Involvement in Learning, Survey Research

Presenting Author: Juuso Henrik Nieminen, University of Eastern Finland, Finland; **Co-Author:** Paivi Atjonen, University of Eastern Finland, Finland

While the perspective of teachers in particular and pupils to lesser extent has been acknowledged in literature concerning educational assessment, research on parents is still scarce and undertheorised in relation to assessment. In this study, we address this research gap in the context of Finnish basic education. Through a mixed methods design we observe both parents' (N = 1014) perceptions (with a quantitative approach) and epistemic beliefs (with a qualitative approach based on open-ended questions) concerning classroom assessment. Thus, this study contributes to earlier literature by introducing new empirical evidence from the context of Finland, but also through further theorising parents' role in assessment. According to the quantitative results, Finnish parents had mostly positive perceptions of assessment, with only a few drawbacks identified. They strongly hoped for numerical assessment, rather than verbal comments, for the clarity of assessment information. We deepened these findings through a reflexive thematic analysis of teachers' epistemic beliefs concerning assessment. These qualitative results showed that parents lacked epistemic resources with which to interpret assessment data. With the theorisation of parents' epistemic beliefs, we shift the focus from parents to the structures of assessment that restrict their epistemic resources than aim for fostering them. Based on the results, implications for assessment design are discussed.

Session I 8

24 August 2021 15:45 - 16:45

Session Room 13

Single Paper

Instructional Design, Learning and Instructional Technology

Instructional Design and Learning Technologies

Keywords: Citizenship Education, E-Learning/Online Learning, Educational Psychology, Instructional Design, Learning Technologies, Meta-analysis, Multimedia Learning, Primary Education, Secondary Education

Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Sylvi Vigmo, University of Gothenburg, Sweden

Digital citizenship in primary education. From theoretical models to curriculums

Keywords: Citizenship Education, Instructional Design, Learning Technologies, Primary Education

Presenting Author: Lionel Alvarez, HEP-Fribourg | Université de Fribourg, Switzerland; **Co-Author:** Kostanca Cuko, University for Teacher Education Fribourg, Switzerland; **Co-Author:** Ania Tadlaoui-Brahmi, Universiti for Teacher Education Fribourg, Switzerland

Digital citizenship, defined as the capacity to engage positively, critically, and skillfully in digital environments, is chosen as the priority goal for the new K-12 study plan for digital education in the French-speaking side of Switzerland. As material for teachers has to be developed, it first has to be clearly defined, and ambitions benefit from being well delineated. This paper explains the process explored by a group of developers of pedagogical material, from digital citizenship

models found in the scientific literature to the teaching material created. From this process, the choices of the digital environments used with students and the message vehiculated appeared to be key components to actually engage in an inclusive digital citizenship curriculum.

Effects of digital media on knowledge acquisition in school: A systematic review of meta-analyses

Keywords: Learning Technologies, Meta-analysis, Primary Education, Secondary Education

Presenting Author: Tamara Kastorff, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:** Karsten Stegmann, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:** Sonja Berger, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:** Michael Sailer, LMU Munich, Germany; **Co-Author:** Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

This systematic review of meta-analyses examines the question to what extent knowledge acquisition in school can be facilitated by digital media. Meta-analyses on learning with digital media are usually emphasizing moderator analyses regarding specific technological features. This systematic review of meta-analyses aggregates the effects of digital media by the level of learning activities induced through digital media. Therefore, control and experimental conditions of 79 effect sizes from ten meta-analyses were coded using the ICAP taxonomy. The ICAP taxonomy differentiates four levels of cognitive activation based on observable behavior: (1) passive, (2) active, (3) constructive, and (4) interactive. The effect sizes were clustered according to effects of digital media at the same level of activity and effects of digital media at different levels of activity in control and experimental conditions. The positive effects of digital media within the ICAP levels on knowledge acquisition in school (RQ1) support the interpretation that digital media effectively increase the likelihood of certain learning activities. The positive effects of digital media across the ICAP levels on knowledge acquisition in school (RQ2) showed that digital media can effectively be used to increase the level of activity. However, caution is required in interpreting this as a causal effect of digital media due to the confounding of the level of activity and use of digital media. Overall, the findings support the ICAP taxonomy and the assumptions about the relationship between the different levels of activity and knowledge acquisition.

Does the effect of instructor's presence in videos vary with slide type and presentation type?

Keywords: E-Learning/Online Learning, Educational Psychology, Instructional Design, Multimedia Learning

Presenting Author: Christina Sondermann, German Institute for Adult Education, Germany; **Co-Author:** Martin Merkt, Deutsches Institut für Erwachsenenbildung, Germany

Because video-based learning plays an increasingly important role - and not just since the Corona pandemic - the optimal design of video-based learning materials garners the attention of scientists and practitioners alike. In this context, designers of online courses or lectures face the question whether it makes sense to integrate the instructor into educational videos. In two online experiments, we investigated the effect of the instructor's presence on learning outcomes and participants' subjective ratings of the videos. We varied as between-factor whether the instructor was present or absent in learning videos including narrated slides and as within-factor whether the visual content was relevant for learning or mostly redundant with the narration (operationalized by graphic vs. text slides). While in Experiment 1 the contents on the slides appeared sequentially to all participants, in Experiment 2 we additionally varied the type of presentation as a between-factor (sequential vs. static presentation). Results of Experiment 1 indicated no detrimental effects of instructor's presence on learning outcomes (i.e., knowledge acquisition) and perceived difficulty, independent of slide type. We were able to replicate these findings for the comparable conditions (i.e., conditions with sequential presentation) in Experiment 2. Contrary to our expectations, there was no learning-impairing effect of the present instructor on graphic slides with static presentation. However, a significant interaction in Experiment 2 showed that perceived difficulty was highest in this condition. Potential explanations for the findings and possibilities for future research are discussed.

Session I 9

24 August 2021 15:45 - 16:45

Session Room 9

Single Paper

Cognitive Science

Cognitive Development and Conceptual Change

Keywords: Cognitive Development, Conceptual Change, Experimental Studies, Higher Education, Knowledge Creation, Misconceptions, Numeracy, Philosophy

Interest group: SIG 03 - Conceptual Change, SIG 05 - Learning and Development in Early Childhood

Chairperson: Klara Bolander Laksov, Stockholm University, Sweden

Modes of dealing with opposing theoretical perspectives in cognitive science

Keywords: Cognitive Development, Conceptual Change, Knowledge Creation, Philosophy

Presenting Author: Thorsten Scheiner, Australian Catholic University, Australia

Many issues in cognitive science are expansive and multi-faceted, and therefore open to diverse interpretations that often lead to contrasting, even conflicting, theoretical perspectives. Relatively little attention has been paid to the opportunities offered by conflicts, tensions, and paradoxes among theoretical perspectives for theory building. In this presentation, four modes of dealing with opposing theoretical perspectives are outlined: (1) taking contrasting theoretical perspectives as incommensurable; (2) holding opposites not as conflicting but as complementary; (3) dissolving or surpassing oppositions by blending perspectives; and (4) preserving paradoxes by recognizing the interdependence of constitutive oppositions. These four modes are exemplified by application to the long-standing debate of knowledge as theory-like versus knowledge as piece-like in research on conceptual change.

Conceptual change in random transfer probability reasoning

Keywords: Cognitive Development, Conceptual Change, Higher Education, Misconceptions

Presenting Author: Ida Kukliansky, Ruppin Academic Center, Israel; **Co-Author:** Yael Tal, Tel Aviv University, Israel

Faced with two urns: Urn A contains 3 black balls and 2 white balls while Urn B contains 2 black balls and 1 white ball, you are asked to compare the probability of randomly drawing a black ball from the two urns. Next, you are asked how the probability of drawing a black ball from Urn B will change after transferring a random ball from Urn A to Urn B. These two tasks differ in their content and question but can be solved analytically in the same way by comparing probabilities. While the first task has been widely discussed in previous studies, the reasoning associated with the second task having an additional condition of uncertainty has not. The 66 college students, participants in this study, used an analytic process for the first task and a heuristic for the second task. The findings show that they focused on the most likely event and derived a prediction based on this event that, in some cases, led them to answer incorrectly. The educational implications include a gradual method for developing better intuition for the students.

When do children understand that number words refer to exact cardinalities?

Keywords: Cognitive Development, Conceptual Change, Experimental Studies, Numeracy

Presenting Author: Pierina Cheung, National Institute of Education/Nanyang Technological University, Singapore, Singapore

When do children understand that number words such as "five" refer to exactly 5 things? Understanding that number words are exact is a pre-requisite for acquiring numerical knowledge. On one view, only children who understand the meaning of the last word of a count (cardinal principle) know that number words are exact. On another view, children know that number words refer to exact cardinalities prior to acquiring the cardinal principle. The current study addresses this using an experimental task adapted from previous studies. If children know that number words are exact, they should understand that a set labelled as having N objects no longer have N when an object is added to or removed from the set. We tested this in a group of 80 children between the ages of 2 ½ and 5 ½. We showed children a box of objects labelled as having N objects. N sometimes refers to known number words such as "five" and sometimes an unknown number such as "a hundred and fifty-six". An experimenter then performed a transformation and asked whether there are still N objects in the box. We found evidence that children likely have early knowledge of the exactness prior to acquiring the cardinal principle but such knowledge is limited, because these children cannot

reliably reason about the effect of transformation on unknown number trials.

Session I 10

24 August 2021 15:45 - 16:45

Session Room 8

Single Paper

Assessment and Evaluation, Learning and Instructional Technology, Learning and Social Interaction

Inquiry Learning in Science Education

Keywords: Computer-supported Collaborative Learning, Inquiry Learning, Learning Analytics, Motivation, Out-of-School Learning, Peer Interaction, Qualitative Methods, Science Education

Interest group: SIG 20 - Inquiry Learning, SIG 21 - Learning and Teaching in Culturally Diverse Settings, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Eric Pakulak, Stockholm University, Sweden

Towards student' autonomy for peer-to-peer interaction: Affordance of dialogic scaffolding routines

Keywords: Inquiry Learning, Peer Interaction, Qualitative Methods, Science Education

Presenting Author: Sally Gutierrez, Far Eastern University, Philippines, Philippines

In this case study, we explore the affordance of teacher's dialogic scaffolding routines to acquaint the students on the norms of dialogic interaction. These routines progressed in terms of the complexity of dialogic tasks from responding to simple recall or identify to explain, argue, decide, elaborate. Simple recall statements were used to elicit the students' prior knowledge and to establish their prerequisite knowledge as they advance into collaboratively resolve socioscientific issues. As the students acquire the skills, they gained the autonomy to discuss on their own as shown in the episodes of peer-to-peer interactions in the classroom transcripts. Guided by the dialogic teaching repertoire, our in-depth analysis of various data (classroom audio and video transcripts, fields notes, teacher interviews, and students' focused-group discussion) for our case study explored the affordance of dialogic scaffolding routines of a secondary school towards peer-to-peer dialogic interaction. A cycle of three dialogic scaffolding routines afforded students' participation: 1) *setting the pace*; 2) *appropriating students' ideas by clarifying their thinking and allocating their dialogic contributions* and 3) *probing students to deepen their reasoning*. The shift from teacher-student to peer-to-peer dialogic interaction was due to the students' acquaintance to the routines. Our analysis revealed that the success of using these dialogic scaffolding routines can be attributed to the teacher's intentional move to use dialogues as an inquiry approach to learning socio-scientific issues in a whole class setting. Given proper implementation, we therefore highlight the potentials of dialogic scaffolding in increasing students' engagement in science classrooms.

How can deep networks help us in the coding of discussions in the context of inquiry learning?

Keywords: Computer-supported Collaborative Learning, Inquiry Learning, Learning Analytics, Science Education

Presenting Author: Pablo Uribe, Centro de Investigación Avanzada en Educación, Chile; **Co-Author:** Joni Lämsä, University of Jyväskylä, Finland; **Co-Author:** Abelino Jimenez, Universidad de Chile, Chile; **Co-Author:** Daniela Caballero, Universidad de Chile, Chile; **Co-Author:** Roberto Araya, Universidad de Chile, Chile; **Co-Author:** Raija Hämäläinen, University of Jyväskylä, Finland

Computer-supported collaborative inquiry-based learning (CSCIL) is where students follow the practices of scientists to solve problems. Because students' support needs in CSCIL vary in the different inquiry-based learning (IBL) phases (orientation, conceptualisation, investigation, conclusion and discussion), we studied the features of an innovative computational model that could improve the accuracy of the automatic coding in the different IBL phases. We focused on face-to-face CSCIL conversations of 11 groups (55 undergraduate physics students). As a computational model, we applied deep networks with attention mechanisms by utilising a pre-trained language model. We implemented three additional features to the model, and we considered the linguistic, quantitative and temporal context of the coded utterance. The study shows that considering the previous and following utterances (linguistic context), along with the relative position of the utterance (temporal context), improved the model's accuracy. Considering the number of words of the utterance (quantitative context) did not lead to significant improvement in the model's accuracy. Our method illustrates how computational models can be trained for specific purposes (e.g., to code IBL phases) with small data sets by using pretrained models.

Exploring the Effectiveness of an Innovative Science Outreach Programme for Migrant Students

Keywords: Inquiry Learning, Motivation, Out-of-School Learning, Science Education

Presenting Author: Julia Schiefer, University of Tuebingen, Germany; **Co-Author:** Joana Moscoso, Native Scientist, United Kingdom; **Co-Author:** Ana Isabel Catarino, Flanders Marine Institute (VLIZ), Belgium; **Co-Author:** Jana Philipp, University of Tuebingen, Germany; **Co-Author:** Pedro Miranda Afonso, Erasmus Medical Center, Department of Biostatistics, Netherlands; **Co-Author:** Ulrich Trautwein, University of Tübingen, Germany; **Co-Author:** Jessika Golle, University of Tuebingen, Germany; **Co-Author:** Patrick Rebuschat, Lancaster University, United Kingdom

Inspiring ethnic minority students to pursue higher education in STEM (Science, Technology, Engineering, and Mathematics) is a challenge currently faced by many European countries. This target group of pupils often underperforms in STEM subjects due to a variety of reasons, including specific linguistic and educational needs. In this study, we introduce an innovative science outreach and educational programme, which follows a science and language integrated learning approach. It brings together real-world bilingual STEM professionals and migrant students for after-school science workshops in their heritage language. The 90-minute workshops aim to provide the students positive learning experiences and feature an inquiry-based approach, hands-on activities and science communication with potential role models. We applied a multisite cluster randomized controlled trial with repeated measures to investigate the effects on students' motivation for science and for their heritage language (Portuguese). Eighty-three migrant pupils (aged 6 to 17 years) participated in six cities in two European countries in this study. We observed, in our treatment group compared to the control group, after four weeks a tendency of increased attainment value for science and an increased self-concept of ability in Portuguese. Furthermore, we observed in both groups immediately after the workshops an increase in the students' intrinsic interest, attainment value, self-concept, and intention to future participation in science as well as their intrinsic interest for Portuguese. The results provide evidence for the effectiveness of the workshops and indicate that it is possible to foster migrant students' motivation by a short intervention of a science outreach programme.

Session I 11

24 August 2021 15:45 - 16:45

Session Room 12

Espresso Symposium

Learning and Social Interaction

Family-School Cooperation: Insights into Policy, Experiences, and Best Practice

Keywords: At-risk Students, Content Analysis, Cultural Diversity in School, Educational Policy, Educational Psychology, Interdisciplinary, Learning Technologies, Parental Involvement in Learning, Primary Education, Qualitative Methods, Quantitative Methods, Secondary Data Analysis, Secondary Education

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Caroline Villiger, University of Teacher Education Bern, Switzerland

Discussant: Angelika Paseka, University of Hamburg, Germany

With changing societies and education's raised importance for life success, family-school cooperation has gained increasing attention. Based on theories highlighting the relationship of two systems which are supposed to closely work together to promote the child's development (e.g., Epstein, 1987, inspired by

Bronfenbrenner, 1979), the symposium aims at investigating the legal regulation, implementation and practice of this cooperation. Teacher education is in need of evidence-based knowledge about family-school cooperation and examples of best practice. This symposium encompasses four studies based on different methodological approaches (document and literature analyses, quantitative and qualitative research) which all investigate and highlight a specific or challenging aspect of this cooperation and discuss it in the context of teacher education. Schuler et al. investigate legal regulations of 21 German-speaking cantons in Switzerland and forms of family-school cooperation and parental involvement they facilitate; Leenders and de Jong present a qualitative study from the Netherlands based on interviews with teachers about their practice; Bonanati et al. report from a German quantitative study investigating associations between parents' skills/practices and perception of information and school invitations in the context of ICT use; and finally, Dusi et al. present a literature research focusing on best practice examples of family-school cooperation. A subsequent discussion uncovers relevant issues and implications for teacher education. Thus, the symposium provides insights in different aspects of family-school cooperation, contributes to advance empirical research in this subject and highlights best practice of family-school cooperation.

Types of Parent-School Cooperation – An Analysis of Cantonal Laws and Regulations in Switzerland

Presenting Author:Nadine Schuler, PH Bern - School of Teacher Education, Switzerland; **Co-Author:**Caroline Villiger, University of Teacher Education Bern, Switzerland; **Co-Author:**Anna Hostettler, PH Bern - School of Teacher Education, Switzerland

Parent-school cooperation is a topic which has gained increasing attention in our societies during the last decades. One reason for this is the largely recognized importance of family context and parental engagement in academic learning. However, legal regulations regarding parental involvement in school affairs have rarely been analyzed in detail. This contribution examines how parent - school cooperation is legally regulated in the German-speaking cantons of Switzerland and investigates intended forms of parental involvement. The qualitative content analysis is based on cantonal education laws, regulations, and additional documents of 21 cantons (in total 62 documents). Findings indicate that cantonal regulations vary regarding the level of elaboration and types of cooperation. The extent to which parents are enabled to participate in school affairs is diverse across the cantons. Overall, this research presents detailed findings about the current legal regulations of parent-school cooperation in the German part of Switzerland and provides insights for educational policy as well as for teacher education and school development.

Family-School Partnerships with migrant Families and Low-SES Families

Presenting Author:Hélène Leenders, Fontys University of Applied Sciences, Netherlands; **Co-Author:**Johan de Jong, Fontys University of applied sciences, Netherlands

Abstract This study investigates teachers' communication with Dutch low SES parents and migrant parents, based on 55 in-depth interviews with primary school teachers. Teachers were asked how they communicate with parents with a different cultural or ethnic background and/or home language and to give concrete examples of these discussions. A total of 104 examples from 34 teachers were analysed. We checked if these teachers are sensitive, compassionate and responsive to the needs of these parents; interested in their home situation, background, and home language; non-judgemental and understanding; and how they support the parents' self-efficacy. The results illustrate that teachers (1) are sensitive, compassionate and encouraging towards parents with no money, a refugee status, poor language skills, and poor parenting skills, (2) discuss poverty, abuse, and neglect in a non-judgemental way, (3) put extra time and effort in aligning reciprocal expectations on children's upbringing, and (4) do their best to communicate with parents, despite language barriers. Several strong involvement practices are reported, to support parent's self-efficacy. The study underlines the need for schools to choose parent involvement strategies that work with the population of their school, considering differences in cultural norms by socio-economic status of their school population.

Family-School-Cooperation in ICT Contexts: Associations to Parents' Skills and Parenting strategies

Presenting Author:Sabrina Bonanati, Paderborn University, Germany; **Co-Author:**Nicole Gruchel, University of Paderborn, Germany; **Co-Author:**Ricarda Kurock, University of Paderborn, Germany; **Co-Author:**Heike Buhl, University of Paderborn, Germany

Family-school-partnership (FSP) has an important potential regarding the communication between schools and parents about using information and computer technology (ICT) for homework. This is important because many uncertainties make it difficult for parents to choose the appropriate parenting strategies regarding ICT regulation. First, FSP can foster parents' own ICT skills. Second, it can support parents' choice of appropriate parenting strategies. We investigated how parents perceived two forms of various and respectful family-school-communication about ICT, differences in these types of communication regarding structural family characteristics, and the association of FSP with parents' own ICT skills as well as parents' choice of parenting strategies. $N = 737$ eleven-year-old students and $N = 417$ of their parents answered a paper-pencil questionnaire. Structural equation modeling was applied to test the associations. The results show: (1) Parents perceived only little FSP about children's use of ICT for homework. (2) Parents with lower educational degrees and parents who were not born in Germany perceived a higher extent of FSP. (3) FSP was significantly negative related to parents' own ICT skills but not to parenting strategies. Thus, parents who reported to be less competent in their ICT skills perceived more FSP in the ICT context. The results implicate that schools may react sensitively to parents' needs. Furthermore, it is possible that parents who felt less competent in the ICT context were more aware of the information and invitations schools provided. Further opportunities to establish a constructive FSP in the ICT context will be discussed.

Best Practice in Cultivating School-Family Cooperation in Primary Education: A Scoping Review

Presenting Author:Paola Dusi, University of Verona, Italy; **Co-Author:**Audrey Addi-Raccah, Tel Aviv University, Israel; **Co-Author:**Maria Luisa Mori, University of Verona, Italy

The school-family relationship has been a subject of study for decades. Terms used include diverse terminologies such as *family involvement* and *engagement*, *school-family partnership*, and *shared responsibility for education*. Each terminology encapsulates a distinct understanding of the school-family relationship that reflects a particular cultural context and theoretical paradigm. These two institutions have a somewhat problematic history including both experiences of effective co-planning and tacit pacts of non-interference, in recent years in a climate of rising antagonism. In the meantime, new fragilities have taken root fostered by the socio-economic transformations wrought by an unsparing neoliberalism, presenting school institutions and educators with new educational crises.

In an environment of elevated uncertainty, if we wish to steer the transition in progress towards greater sustainability and educational models of a more human scale, a new educational pact between the family and school is needed. The ongoing effects of the global COVID-19 health crisis have only further underlined the crucial role played by the school system within the life of the family, and the importance of the parent-teacher relationship.

With this in mind, we aim to survey published primary research looking for best practice in the promotion of parental involvement and the sharing of responsibility for education in the context of elementary schooling. We will present the results of a scoping review of articles looking at best practice in the context of the S.-F. relationship that have been published in the last 7 years (2014-2020) in peer reviewed journals.

Session I 12

24 August 2021 15:45 - 16:45

Session Room 14

Single Paper

Motivational, Social and Affective Processes

Attitudes, Beliefs and Mathematics

Keywords: Attitudes and Beliefs, Educational Psychology, Mathematics, Peer Interaction, Quantitative Methods, Secondary Data Analysis

Interest group: SIG 08 - Motivation and Emotion, SIG 17 - Methods in Learning Research

Chairperson: Kevin Ackermans, Open University, Netherlands

How Classmates' Gender Stereotypes Affect Students' Math Self-Concepts: A Multilevel Analysis

Keywords: Attitudes and Beliefs, Educational Psychology, Mathematics, Peer Interaction

Presenting Author:Fabian Wolff, Universität Koblenz-Landau, Germany

The present research is the first to examine how students' individual and their classmates' math-related gender stereotypes, endorsing that math would be a typically male domain, relate to students' math self-concepts. To this end, data of $N = 1,424$ secondary school students were analyzed using multilevel analyses. As expected, strong individual beliefs in the math-related gender stereotype were related to lower math self-concepts for girls, but to higher math self-concepts for boys. Unexpectedly, however, classmates' shared beliefs in this stereotype were not related to girls' self-concepts but showed a negative relation to boys' self-concepts, after controlling for students' age and math grades. Overall, the results of the present study demonstrate that shared gender stereotypes can have a substantial impact on students' self-concepts, beyond their individual gender stereotypes. More specifically, they provide support for the significant role of classmates as important socializing peers in the process of students' self-concept formation. In addition, the negative contextual effect of classmates' stereotypes on boys' self-concepts illustrates that math-related gender stereotypes can impair both girls' and boys' math self-concepts.

Means, Tails and Fairytales – Fabulous methods to investigate gender differences**Keywords:** Attitudes and Beliefs, Mathematics, Quantitative Methods, Secondary Data Analysis**Presenting Author:**Christian Thurn, ETH Zurich, Switzerland; **Co-Author:**Thomas Braas, ETH Zurich, Switzerland; **Co-Author:**Michal Berkowitz, ETH Zurich, Switzerland

Gender differences are a hotly debated topic. While several theories for their causes exist (Hyde, 2005), most studies only focus on a restricted range of methods to investigate gender differences. We provide an overview of methods (e.g. mean comparisons, percentile comparisons, variance ratios, equivalence tests,) frequently used separately, and show the advantages of using them together. We simulate the behavior of the methods across a range of possible sample sizes and score distributions. By exemplifying the use of these methods, we hope to provide insights into how differently the same data can appear in light of different methods. With this overview, we provide researchers with some guidelines regarding which methods should be considered in which cases when investigating gender differences. Furthermore, while some methods (e.g. percentile comparisons) are usually applied to achievement data (e.g. Wai et al., 2010; Baye & Monseur, 2016), in our case also TIMSS physics test data, we also extend their application to self-concept ratings in math and German, as well as fear-of-failure in students. For self-concept, this reveals interesting distribution patterns, with girls underrepresented in the lower half of math self-concept, but also overrepresented in the upper half of German self-concept. Whereas this aligns with findings from gender-related intraindividual differences (e.g. Herbert & Stipek, 2005; Saß & Kampa, 2019; Marsh & Yeung, 1998), the methods we suggest provide more immediate information on the scope of these differences.

Session I 13

24 August 2021 15:45 - 16:45

Session Room 5

Single Paper

Instructional Design, Teaching and Teacher Education

Teaching and Instruction in Secondary Education**Keywords:** Mixed-method Research, Phenomenography, Reading Comprehension, Secondary Education, Self-regulation, Student Learning, Teaching/Instruction**Interest group:** SIG 09 - Phenomenography and Variation Theory, SIG 11 - Teaching and Teacher Education**Chairperson:** Frank Reinhold, University of Education Freiburg , Germany**Quality of reading instruction in language classrooms: Subject specific analysis of teaching quality****Keywords:** Reading Comprehension, Secondary Education, Self-regulation, Teaching/Instruction**Presenting Author:**Anke Schmitz, Leuphana Universitaet Lueneburg, Germany; **Co-Author:**Fabiana Karstens, University of Cologne, Germany

Self-regulated reading is fruitful to foster reading comprehension in the early years of secondary school. Unfortunately, it is quite unclear how teachers instruct self-regulated reading and of what quality their instruction is. Regarding current classroom research, three generic dimensions of teaching have proven to be relevant for students' learning outcomes. As these dimensions stem from the discipline of mathematics and science, their adaptation to other subjects has to be validated. However, it is presumed that the dimension of cognitive activation should be most subject-specific. To achieve a deeper insight into teaching quality in language classrooms, the present paper focuses on the quality of self-regulated reading instruction at secondary school (grade 5) to analyze which dimensions of teaching quality get evident in such learning areas and how they correspond to the three established generic dimensions of teaching. 135 teachers in Germany were asked about their teaching practices when instructing self-regulated reading in regular classrooms. Items oriented at the construct of self-regulated reading and classroom research. Exploratory factor analyses reveal seven dimensions of teaching quality. Calculations with restrictions to three factors show similarities to the three generic dimensions of teaching quality, but also differences. Currently, the present findings are validated with confirmatory factor analyses and also compared to students' perceptions to investigate differential perspectives.

Teachers' knowledge and beliefs about reading comprehension instruction: differences across tracks?**Keywords:** Mixed-method Research, Reading Comprehension, Secondary Education, Teaching/Instruction**Presenting Author:**Kim Van Ammel, Ghent University, Belgium; **Co-Author:**Koen Aesaert, Catholic University of Leuven, Belgium; **Co-Author:**Rielke Bogaert, Ghent University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium

Although secondary school teachers' reading comprehension instruction is unquestionably related to their knowledge and beliefs, uncertainty remains about how they conceptualize effective reading comprehension instruction. Additionally, teachers' instruction, knowledge and beliefs are presumably different across educational tracks. Therefore, mapping secondary school teachers' knowledge and beliefs regarding reading comprehension instruction across different tracks is the main focus of this research. Qualitative as well as quantitative data were gathered from 86 9th-grade teachers. Quantitatively, teachers were queried about their generic and self-efficacy beliefs regarding explicit reading comprehension strategy instruction and about their frequency of implementing this. Additionally, their students ($N = 1934$) completed a standardized reading comprehension test. Data were analyzed using oneway ANOVA, cluster analysis, and multilevel regression analysis. Qualitatively, teachers were asked to describe how they aim to enhance their students' reading comprehension skills. Answers were rigorously analyzed using thematic analysis. The results reveal a state-of-the-art as to secondary school teachers' knowledge and beliefs regarding reading comprehension instruction. Additionally, differences across teachers teaching in different educational tracks are uncovered, based on a combination of qualitative and quantitative data. Finally, this study unveils the relationship between teachers' beliefs regarding explicit reading comprehension strategy instruction and their students' reading comprehension scores, taking into account possible differential relationships across educational tracks. Implications for theory and practice will be discussed.

Enhancing Students' Financial Literacy to promote citizenship through the use of variation theory**Keywords:** Phenomenography, Secondary Education, Student Learning, Teaching/Instruction**Presenting Author:**Ming Fai Pang, The University of Hong Kong, Hong Kong

This study aims to collect evidence about the efficacy of the pedagogical principles derived from our earlier study on boosting students' financial literacy, with the purpose of providing a theoretical account of how generative learning in the domain of financial literacy can be enhanced. A learning study in the form of design experiment was conducted, in which 156 students were taught under the three learning conditions which embedded the test criteria, and seven lessons were used by the two participating teachers for each of the classes. To assess students' appropriation of the object of learning, four tests were conducted, i.e. a pre-test, post-test immediately after the lessons, delayed post-test after six weeks and second delayed post-test after six months. This study shows that a systematic use of the pattern of "contrast-fusion-generalization" to deal with the individual core economic concepts identified can help students lay a solid conceptual foundation for developing financial literacy. Furthermore, with the use of the meta-level pattern of "contrast-fusion-generalization" through complex everyday financial problems or situations which transcend the specific concepts, students can make effective use of the core economic concepts learnt and

transform them organically into one's analytical framework. This enables students to discern and focus upon the critical aspects of novel financial situations and have a greater likelihood of making well-reasoned financial decisions. This paper sheds light on the ways in which students' generative learning in the domain of financial literacy can be enhanced to promote citizenship through the use of variation theory of learning.

Session I 14

24 August 2021 15:45 - 16:45

Session Room 16

Single Paper

Teaching and Teacher Education

Reasoning and Pre-service Teacher Education

Keywords: Argumentation, Educational Psychology, Pre-service Teacher Education, Problem Solving, Reasoning, Teacher Professional Development, Video Analysis

Interest group: SIG 11 - Teaching and Teacher Education, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Jenny Lenkeit, University of Potsdam, Germany

Expertise differences in professional vision among prospective teachers

Keywords: Pre-service Teacher Education, Reasoning, Teacher Professional Development, Video Analysis

Presenting Author: Ann-Sophie Grub, Saarland University, Germany; **Co-Author:** Antje Biermann, Saarland University, Germany; **Co-Author:** Doris Lewalter, Technical University of Munich (TUM), Germany; **Co-Author:** Roland Bruenken, Saarland University, Germany

Early recognition of potential disturbances in learning environments is of great importance for a proactive control of the teaching process and for maximizing learning outcomes. However, for a successful classroom management professional competence of a (prospective) teacher is required. The professional vision of a teacher serves as a link between teacher's knowledge and classroom management behaviour and can be divided into the two aspects noticing and reasoning. It is known from expertise research in different domains that experts and novices show differences in visual perception processes based on their expertise level. Previous research in the field of teaching has mainly focused on expertise differences between novice and expert teachers, whereas only a few studies focused on expertise differences within the groups of prospective or rather novice teachers. In an online-based study concerning the perception of teaching situations by prospective teachers ($N = 85$), the connection between knowledge about classroom management and professional vision of potential disruptions in the classroom by using video clips of a learning situation was investigated. The most recent results of the underlying study show that professional vision varies at an early stage of a teacher's career, depending on the level of knowledge. Those prospective teachers with a high knowledge level showed a more accurate performance in perceiving classroom management related aspects and noticed them earlier. The results emphasize the relevance of practical knowledge transfer during university education.

Pre-Service Teachers' Diagnostic Argumentation: Diagnostic Accuracy Is Not Enough

Keywords: Argumentation, Educational Psychology, Pre-service Teacher Education, Reasoning

Presenting Author: Elisabeth Bauer, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:** Michael Sailer, LMU Munich, Germany; **Co-Author:** Jan Kiesewetter, LMU University Hospital, Germany; **Co-Author:** Martin R. Fischer, LMU University Hospital, Germany; **Co-Author:** Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

Learning diagnostic skills is relevant for future professionals from various disciplines, among which are also pre-service teachers. So far, research and education in diagnosing mostly focus on applying diagnostic knowledge to make accurate diagnostic decisions. However, we argue that diagnostic accuracy is not enough to understand and capture diagnostic skills, which is why we introduce and investigate a conception of diagnostic argumentation. We emphasize the role of structural facets in argumentation quality instead of exclusively focusing on the accuracy of diagnoses and evidences and suggest three facets of diagnostic argumentation, namely justification, disconfirmation and transparency. We raise the issue, whether they reflect one overall skill or distinguishable sub-skills (RQ1) and how they are related to or distinct from the accuracy of diagnostic decisions (RQ2). We used data of 118 pre-service teachers, who were learning with simulated cases concerned with the topic of students' learning difficulties. Participants indicated a diagnosis and wrote a diagnostic argumentation for different cases. Overall, we interpret the correlational results as justification, disconfirmation and transparency representing three distinct sub-skills of diagnostic argumentation. Moreover, we interpret the findings as supporting the notion that structural qualities of diagnostic argumentation and accurate diagnostic decisions should be considered as two different diagnostic skills and thus learning outcomes.

Fostering pre-service teachers' reasoning script by productive failure: Does the grain level matter?

Keywords: Pre-service Teacher Education, Problem Solving, Reasoning, Teacher Professional Development

Presenting Author: Theresa Wilkes, Saarland University, Germany; **Co-Author:** Martin Greisel, University of Augsburg, Germany; **Co-Author:** Christina Wekerle, University of Augsburg, Germany; **Co-Author:** Kati Trempler, University of Wuppertal, Germany; **Co-Author:** Ingo Kollar, University of Augsburg, Germany; **Co-Author:** Robin Stark, Saarland University, Germany

Pre-service teachers' deficits when dealing with educational problems can be explained by an insufficient internal problem-solving script (IPSS). An IPSS might be promoted by integrating sample solutions and erroneous solutions in the approach of productive failure. Due to ambiguous empirical findings, it remains unclear which grain level of provided solutions is appropriate. The present 2x3-factorial experimental intervention study investigated how different grain levels of a sample solution (generic [G], generic-concrete [C]) and of an erroneous solution (none, generic [g], generic-concrete [c]) affect the internalization of an IPSS. $N=390$ pre-service teachers analyzed a written classroom situation, while the IPSS was prompted. Then, they compared their own solution to an author-generated solution whose grain level was varied (six groups: G, Gg, Gc, C, Cg, Cc). Learning outcomes (components of the IPSS) and learning processes (comparing solutions) were assessed. The generic-concrete sample solution led the participants to reproduce more components of the IPSS in the post-test than the generic sample solution. During learning, however, the generic sample solution led to more comparisons. Further, participants with any erroneous solution reproduced more components in the post-test and made more comparisons during learning than those without. Participants who received the generic sample solution and the generic erroneous solution produced the most comparisons. In conclusion, pre-service teachers might be prepared best to deal with educational problems, if they train their IPSS with a sample solution that provides both a generic description and a concrete example for the solution, and a generic erroneous solution describing common errors.

Session I 15

24 August 2021 15:45 - 16:45

Session Room 3

Single Paper

Assessment and Evaluation, Instructional Design

Student Learning in Primary and Secondary Education

Keywords: Assessment Methods and Tools, Comprehension of Text and Graphics, Learning Approaches, Primary Education, Reading Comprehension, Secondary Education, Student Learning

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 06 - Instructional Design

Chairperson: Astrid Camilla Wiig, Norway

Development of a measurement instrument for upper primary students' reading strategy use

Keywords: Assessment Methods and Tools, Primary Education, Reading Comprehension, Student Learning

Presenting Author:Rielke Bogaert, Ghent University, Belgium; **Co-Author:**Emmelien Merchie, Ghent University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium

Despite the importance of reading comprehension, many students struggle with it. In this respect, upper primary education is a critical period in the development of reading comprehension strategies. However, there is a lack of appropriate measurement instruments to map these students' strategy use. Therefore, a new task-specific Reading Comprehension Strategies Questionnaire (RCSQ) was developed in this study. Explorative ($n = 1585$) and confirmative factor analyses ($n = 1585$) were performed. The RCSQ emerged from these analyses, containing five subscales: (1) overt cognitive reading strategies, (2) covert cognitive reading strategies, (3) monitoring, (4) evaluating, and (5) using home language in view of comprehending texts. Based on the findings, the theoretical and educational significance of the RCSQ is discussed.

Effect of reminding source relevance or providing prior knowledge in multiple texts comprehension.

Keywords: Comprehension of Text and Graphics, Reading Comprehension, Secondary Education, Student Learning

Presenting Author:María García Serrano, University of Salamanca, Spain; **Co-Author:**José Ricardo García Pérez, University of Salamanca, Spain; **Co-Author:**Javier Rosales, University of Salamanca, Spain

In the last years, our students are commonly involved in multiple text comprehension situations. The necessary skills for multiple text comprehension are several. In this experimental research we are going to analyse source awareness and prior knowledge. It is explored whether a short video talking about the importance of the source and source features or about prior knowledge of the topic they are going to read, just before reading, has effects in the participants' comprehension. We also compare these conditions with a control condition. The results showed that the students, who are reminded to pay attention to source information just before reading, expended less time reading the texts but performed in the comprehension test equally than the prior knowledge group, who spend more time studying the texts, and both performed significantly better than the control group. Differences between conditions in the percentage of success in the comprehension test by type of documents are also explored.

Retrieval-, Distributed-, and Interleaved Practice in the Classroom: A Systematic Review

Keywords: Learning Approaches, Primary Education, Secondary Education, Student Learning

Presenting Author:Sterre Ruitenburg, Open University of the Netherlands, Netherlands; **Co-Author:**Gino Camp, Welten Institute - Open University of the Netherlands, Netherlands; **Co-Author:**Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands; **Co-Author:**Paul Kirschner, Open University of the Netherlands, Netherlands

Three of the most effective learning strategies identified are *retrieval practice*, *distributed practice*, and *interleaved practice*, also referred to as desirable difficulties. However, it is yet unknown to what extent these three practices foster learning in primary and secondary education classrooms (as opposed to the laboratory and/or tertiary education classrooms, where most research is conducted) and whether these strategies affect different students differently. To address these gaps, we conducted a systematic review. Initial and detailed screening of 869 documents found in a threefold search resulted in a pool of 29 journal articles published from 2006 through June 2020. Seventy-five effect sizes nested in 47 experiments nested in 29 documents were included in the review. Retrieval- and interleaved practice appeared to benefit students' learning outcomes quite consistently; distributed practice less so. Furthermore, only cognitive Student*Task characteristics (i.e., features of the *student's* cognition regarding the *task*, such as initial success) appeared to be significant moderators. We conclude that future research further conceptualising and operationalising initial effort is required, as is a differentiated approach to implementing desirable difficulties.

Session I 16

24 August 2021 15:45 - 16:45

Session Room 2

Single Paper

Learning and Social Interaction, Lifelong Learning

Informal and Workplace Learning

Keywords: Competencies, Emotion and Affect, Informal Learning, Motivation, Reflection, Technology, Workplace Learning

Interest group: SIG 14 - Learning and Professional Development

Chairperson: Anna-Lena Roos, University of Applied Sciences and Arts Northwestern Switzerland (FHNW), Switzerland

The impact of the COVID-19 pandemic on the digital competencies of HRD professionals

Keywords: Competencies, Informal Learning, Technology, Workplace Learning

Presenting Author:Judith Spirgi, University of St.Gallen, Switzerland; **Co-Author:**Josef Guggemos, University of St.Gallen, Switzerland; **Co-Author:**Sabine Seufert, University of St.Gallen, Switzerland

During the first wave of the COVID-19 pandemic, digital work practices were challenged as training and meetings on-site were not possible anymore. This may have had an impact on the digital competencies of HRD professionals due to more possibilities for informal learning. In a quantitative analysis, we utilized a sample of $N = 300$ human resource developers surveyed in 2019 and 2020 to investigate if digital competencies of HRD professionals on an individual level have increased. The main finding is that self-reported instrumental skills, e.g., digital collaboration, have significantly increased. This might indicate that HRD professionals, benefited from informal learning opportunities during COVID-19

The relationship between emotional competence and team learning behaviours – a systematic review

Keywords: Competencies, Emotion and Affect, Informal Learning, Workplace Learning

Presenting Author:Sebastian Gerbeth, University Regensburg, Germany; **Co-Author:**Elena Stamouli, University of Regensburg, Germany; **Co-Author:**Regina Mulder, University of Regensburg, Germany

Teams have become an essential part of work in the last century to meet the demands of increasingly complex and diverse work tasks resulting from globalisation and digitalization. Organisations and institutions need a variety of work teams that constantly adapt, change and learn. Team learning is promoted by behaviours such as sharing and creating knowledge, that lead to a common team outcome. It can be argued that also cognitive, motivational and emotional factors, are essential to learning behaviours within teams. In this context, team members require different abilities and skills to deal with emotions, which are part of emotional competence (EC). However, empirical evidence on the role of EC in teams and their relationships with team variables is rare and scattered across disciplines and domains. The aim of this study was to provide a systematic review of the relationships between EC and team learning behaviours within teams. A literature search in the databases Web of Science, ProQuest, PSYNDEX and Business Source Premier was carried out and 32 studies identified addressing these relationships. Results show that when teams openly communicate, discuss relevant tasks and emerging problems, and reflect on themselves, they also show a high degree of EC. In particular, the perception of own and others' emotions as well as emotional management support teams and their members and increase the extent of team learning behaviours shown. Although emotional expressivity of teams has hardly been investigated, it plays a key role and is essential to the perception of emotions in a team.

The Role of Empowerment and Reflection for Fostering Job Crafting and Innovative Work Behaviour

Keywords: Informal Learning, Motivation, Reflection, Workplace Learning

Presenting Author:Gerhard Messmann, University of Regensburg, Germany

This paper aims at investigating the role of psychological empowerment and work-related reflection for enhancing innovative work behaviour (IWB) and job crafting. Such proactive behaviours are crucial as a response to increasing variability and change within workplaces and work tasks. Besides being driven by employees' empowerment, initiating proactive behaviours may be enhanced by work-related reflection through which employees may gain awareness for variations and inefficiencies in work processes. This issue was addressed in a cross-sectional questionnaire study with 295 employees in the information sector.

Results of structural equation modelling provided support for the theoretical assumptions that psychological empowerment and work-related reflection facilitate job crafting and IWB. Results also showed that IWB may be enhanced indirectly through fostering job crafting. The paper highlights the importance of work environments that enable employees to experience their work as meaningful, make relevant choices, and carry out tasks they can perform competently and that have desirable outcomes. Likewise, employees should have sufficient opportunities to reflect and, thus, capitalize on their work experiences as these represent valuable resources for coping with future work situations. Moreover, the insight from this study could be used to design interventions that enable employees to strategically access and reuse their work experiences for monitoring, facilitating, or proactively adapting their work behaviour.

Session I 17

24 August 2021 15:45 - 16:45

Session Room 15

Invited Symposium

Lifelong Learning

SIG 10: Social interactions and Life long learning

Keywords: Competencies, Content Analysis, Cultural Psychology, Developmental Processes, Informal Learning, Learning Approaches, Lifelong Learning, Social Development, Social Interaction

Interest group: SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Nathalie Muller Mirza, Université de Genève, Switzerland

Discussant: Valérie Tartas, University of Toulouse 2, France

Ageing becomes a major economic, social and political issue. Research in sociology and psychology has developed focusing on topics such as marginalization, health or cognitive challenges. However, ageing has been rarely studied in terms of learning and development (Grossen, et al., 2021). This symposium aims at discussing the contributions of a *sociocultural psychology* on ageing. This perspective moves away from an individualistic approach and seeks to consider the ageing person as a creative person, for whom learning and development takes meaning both in a personal trajectory and a sociocultural environment. Assuming that learning opportunities are framed partly by social discourses, the first contribution analyses the discourses on ageing that are appropriated by the elderly persons. The authors discuss the tensions highlighted by the interviewees between discourses (for example passivity vs responsibility) and their own experience. The second paper presents situations generated by the creation of a new day-center for older people. Examining three "socio-educative" activities, the authors show how they trigger learning and development, for the older people and the coordinators. The third paper analyses the "tacit knowledge" at stake in the activities carried out by retired persons engaged as volunteers. In their effort of elicitation they show how their engagement is related to different categories of knowledge articulated to personal, interpersonal and institutional dimensions. This perspective on ageing – conceived as a time for learning and development – contributes to renew not only the accompanying practices but also the research practices that moves from a research on towards with people.

The discourses elderly persons are aging, learning and living by

Presenting Author: Aleksander Baucal, University of Belgrade, Serbia; **Co-Author:** Marina Videnović, University of Belgrade, Serbia

The paper is based on a key assumption of the sociocultural approach concerning social and cultural mediation of human mind and activity and is focused on learning activities among elderly persons. Following the sociocultural framework, we assume that using learning opportunities and engagement in learning activities of an elderly person is framed, constituted, and mediated by socially and culturally relevant discourses on aging and learning that are appropriated by the person. Therefore, the main purpose of the paper is to explore the discourses of aging and learning that are available and shared among elderly people in Serbia. Based on a thematic analysis of the six elderly persons meaning of ageing and learning of elderly people we have identified five discourses related to the aging ("The time for enjoying", "Idle hands are the devil's workshop", "Denial of physical changes", "Time for quiet and calm life", and "Elderly persons as socially isolated ones") and two discourses related to the learning of elderly persons ("Slower but wiser learner", and "Nothing is changed besides lack of the interest"). Identified discourses are analysed in the light of contemporary changes of the meaning of ageing and lifelong learning.

Learning and development in older persons in situation of fragility: The creation of a day-center

Presenting Author: Tania Zittoun, Institute of psychology and education, Switzerland; **Co-Author:** Martina Cabra, Institut Psychologie et Education, Université de Neuchâtel, Switzerland; **Co-Author:** Fabienne Gfeller, Institute of education and psychology, University of Neuchâtel, Switzerland

Sociocultural psychology approaches learning and development as situated activities. When it comes to older people in situation of fragility, research tends to emphasize losses, rather than learning: a sociocultural perspective, however, invites us to consider learning and development all lifelong, including in such situations. Based on a current collaborative project studying the transformations of housing modes for older people at a regional scale, we propose to examine the learning and developmental situations generated by the creation of a new day-center for older people in situation of fragility. An ethnographic methodology brought us to identify three situated activities involving coordinators and beneficiaries. We examine, first, in what respects these activities foster learning and development; then, the learning and development involved for each participant – both coordinators and older people; and finally, the possibilities of transformation of the setting itself, seen as a learning system. We finally draw some implications for our understanding of learning, of ageing, and of collaborative research.

Sense-making and tacit knowledge by retirees involved as volunteers in nonprofit associations

Presenting Author: Nathalie Muller Mirza, Université de Genève, Switzerland; **Co-Author:** Antonio Iannaccone, University of Neuchâtel, Switzerland; **Co-Author:** Vittoria Cesari Lusso, University of Neuchâtel, Switzerland

Volunteerism is often described as an activity in which people feel that they matter to others and can contribute to the wellbeing of individuals and societies. Despite the breadth of the phenomenon of volunteering, the research on how it contributes to the development of the volunteers themselves, and how learning develops in these informal or non-formal contexts is quite rare. This is moreover the case for volunteers who are engaged after the retirement age. Adopting a sociocultural perspective on ageing in psychology (Grossen, et al., 2021), this paper aims at exploring the knowledge that retired people mobilize and develop through volunteering. Based on the analysis of 8 "narrative-elicitation" interviews (Cesari Lusso, Iannaccone & Mollo, 2016) made with 4 women and 4 men between the ages of 70 and 85 years, the contribution will document the diversity and complexity of the practices they conduct and their (often tacit and opaque) "enacted knowledge". The findings show how these practices are articulated and affect the sense of continuity and integrity, and confer meaningfulness to interviewees' lives. In a broader perspective, this paper seeks to contribute to both a sociocultural psychology of ageing and an elaboration of methodological techniques aiming at documenting and co-elaborating the subjective experience of "knowing" and learning.

Session J 1

24 August 2021 17:30 - 18:30

Session Room 16

Invited Symposium

Teaching and Teacher Education

SIG 9: Learning study in prospective teacher education

Keywords: Action Research, Design-based Research, Instructional Design, Pre-service Teacher Education, Teaching/Instruction

Interest group: SIG 09 - Phenomenography and Variation Theory

Chairperson: Angelika Kullberg, University of Gothenburg, Sweden

Organiser: Ake Ingerman, University of Gothenburg, Sweden

Discussant: Ake Ingerman, University of Gothenburg, Sweden

Learning study has been implemented in initial teacher education at different places across the globe. It has been suggested that models like learning study and lesson study may help prospective teachers (PT) develop their instructional design skills and teaching competency. Introducing such models for PTs would also enable them to use them in their schools in the future. There has been debate over whether PTs are ready to focus intensely on teaching and student learning during teacher education. Challenges have been pointed out, particularly due to the limited teaching experience that PTs have, the time required for participation, and difficulties understanding and using a specific theory. Regardless of these challenges, studies show that PTs, as well as teacher educators benefit from the experience. This symposium aims to shed light on what PTs and teacher educators learn, and if the models could be used as a means to improve PTs understanding of the relationship between theory and practice.

How the integration of theory and practice supports pre-service teachers in teaching mathematics

Presenting Author:Pernilla Mårtensson, Jönköping University, Sweden; **Co-Author:**Anna-Lena Ekdahl, Jönköping University, Sweden

This presentation aims to illustrate how the integration of theory and teaching experiences can support pre-service teachers to generate knowledge for teaching mathematics. The pre-service teachers took part in a 5-week mathematics education course in a teacher education program in Sweden, in which a theory driven lesson study model entitled learning study were established to deepen the teachers' awareness about the relationship between instruction and student learning. The course design consisted of two intervention cycles in which the pre-service teachers used variation theory as well as their teaching experiences as tools for lesson design and redesign. To enable us to identify if and how theory and experiences drawn from practice were employed and realized, we collected data from the pre-service teachers' individual written reports at the end of the course. The unit of analysis from the written reports were 64 redesigned mathematical tasks and associated reflections about the reason for redesign. We found five different categories of how tasks were modified: expanding tasks, making tasks more explicit, making tasks less explicit, bringing metaphors and representations to the foreground, and creating new tasks. The findings could contribute to reflections and discussions about course design in teacher education and in what way the integration of theory and practice can be regarded as an important key point for pre-service teachers' professional and sustainable learning.

A phenomenological exploration of prospective teachers' experiences learning about variation theory

Presenting Author:Diana Royea, University of British Columbia, Canada

This study examines prospective teachers' lived experiences learning about variation theory and making sense of the relationship between theory and teaching practice while participating in learning study as part of an elementary mathematics curriculum and pedagogy course. The experiences of seven prospective teachers were included in this observational study. Using a descriptive phenomenological approach, data for this study included transcripts of participant interviews, reflective journals, and course assignments. The results indicate that even though the prospective teachers in this study initially did not think about theory in relation to teaching, over the course of the study, prospective teachers deepened their understandings of the relationships between Variation Theory, other learning theories, and teaching and learning. This helps teacher educators better understand how prospective teachers link theory and practice while engaging in learning study activities that are embedded in existing teacher education structures.

Supporting teacher educators' professional learning through Lesson Study

Presenting Author:Sui Lin Goei, Windesheim University of Applied Sciences, Netherlands

Lesson Study is a rapidly growing and increasingly popular teacher professional development approach and is valued for its cyclical, classroom-based and collaborative nature. Mostly used in primary and secondary education, Lesson Study has only recently been applied to the context of initial teacher education focussing on pre-service teachers' professional learning. Only a few studies report on teacher educators participating in Lesson Study. This study aims to fill this gap by examining to what extent Lesson Study is considered a valuable approach to support teacher educators' professional learning and what conditions should be taken into account when applying Lesson Study in their context. Two groups of teacher educators were followed using learning reports as they participated in a Lesson Study cycle. To determine whether the reported reflections sustained in their practice, focus group interviews were held one year after their Lesson Study participation. The results show that, depending on the conditions, participating in Lesson Study can be supportive as a means to focusing on the learning of pre-service teachers, exchanging knowledge and experiences, and counteracting a culture of professional isolation.

Session J 2

24 August 2021 17:30 - 18:30

Session Room 12

Invited Symposium

Motivational, Social and Affective Processes

EFG: From heterogeneous perceptions of instruction and student characteristics to adaptive teaching

Keywords: Achievement, Assessment Methods and Tools, Educational Psychology, Emotion and Affect, Learning Approaches, Motivation and Emotion, Primary Education, Quantitative Methods, Social Development, Teaching Approaches, Teaching/Instruction, Video Analysis

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Lisa Bardach, University of Tübingen, Germany

Organiser: Lisa Bardach, University of Tübingen, Germany

Discussant: Richard Goellner, University of Tuebingen, Germany

Instructional quality is a key driver of educational achievement and motivation. However, students in the same class can vary greatly in their perceptions of the same teacher's instruction. This heterogeneity in students' perceptions has often been ignored by educational researcher or treated as "noise", although heterogeneity could also arise for substantial reasons. For example, students enter class with different sets of individual characteristics, which shape their perceptions or specific interactions between a teacher and students take place. At the same time, heterogeneous perceptions can have important implications and may underlie variability in learning. The aim of our Emerging Field Group and this Symposium is to inform research and educational practice by generating new insights on instruction, heterogeneity in students' perceptions, and strategies to adapt instruction to students' needs.

In the first presentation, Olivier and colleagues adopt a person-centered approach and integrate various components of student-perceived teacher practices to study classroom environments as complex microsystems. The second presentation by Kocaj and colleagues examines students' idiosyncratic perceptions of academic support in class in terms of deviations of individual students' ratings from the class mean, and relations between academic support and educational outcomes. In the third presentation, Schnitzler and colleagues explore student teachers' assessment of student characteristics as precondition for personalized instruction, focusing on the kind of information used and how information usage differs between student teachers with high and low judgment accuracy.

Together, these talks map out an integrated future research agenda on heterogenous perceptions of instruction, student characteristics and adaptive teaching.

Optimal configurations of student-perceived classroom structure and psychosocial learning climate

Presenting Author:Elizabeth Olivier, Université de Montréal, Canada; **Co-Author:**Alexandre Morin, Substantive-Methodological Synergy Research Laboratory, Concordia University, Canada; **Co-Author:**Isabelle Plante, Département de didactique, Université du Québec à Montréal, Canada; **Co-Author:**Véronique Dupéré, École de Psychoéducation, Université de Montréal, Canada; **Co-Author:**Isabelle Archambault, Universite de Montreal, Canada

Students can differ greatly in their perceptions of their teacher's instruction, which may have implications for learning and behavioral development. This study provides a comprehensive assessment of teachers' promotion of classroom goal structure (i.e., mastery-approach, performance-approach, and performance-avoidance) and psychosocial learning climate (i.e., academic support, emotional support, promotion of respect and task-oriented collaboration between students). It seeks to identify the combinations, or configurations, of student-perceived practices contributing to an optimal learning environment to support student school and behavioral adjustment. The study was conducted among a sample of 1,453 7th-grade students (49.0% female; mean age=12.70, s.d.=0.56) from 24 schools located in the province of Quebec (Canada). Longitudinal (across Math and French classes) multi-group (across boys and girls) latent profile

analyses and tests of profile similarity revealed that boys and girls perceived the same five profiles in their French and Math classes. These profiles corresponded to *Unsupportive*, *Average*, *Multi-strategic*, *Performance-oriented*, and *Approach-positive Climate* classrooms. The study also assessed the associations between these profiles and student school (i.e., engagement and achievement) and behavioral adjustment outcomes (i.e., hyperactivity-inattention, externalizing, and internalizing behaviors). The Unsupportive and Performance-oriented profiles were associated with the least positive school and behavioral adjustment outcomes, whereas students reported the most positive behavioral adjustment outcomes when they perceived that their teachers relied on Multi-strategic or Approach-positive Climate profiles. From a theoretical perspective, this intricated set of findings advocate for an intertheoretical integration of various components of teacher practices to obtain a comprehensive investigation of the classroom learning environment as a complex microsystem.

Idiosyncratic Student Perceptions of Academic Support: Relations to Motivation and Achievement

Presenting Author:Aleksander Kocaj, Institute for Educational Quality Improvement (IQB), Germany; **Co-Author:**Claudia Neuendorf, Institute for Educational Quality Improvement (IQB), Germany; **Co-Author:**Kyle Davison, Department of Education, University of Oxford, United Kingdom

Previous studies have highlighted the importance of the classroom's social environment for students' motivation and achievement in school. The present study examined associations between perceived academic support and primary school students' motivation (academic self-concept, interest, enjoyment of learning) in German lessons and their achievement (reading, listening, spelling). We differentiated between receiving support by teachers, receiving support from classmates, and providing support to classmates. Thereby, we focused on students' idiosyncratic perceptions of academic support in terms of the deviation of the individual student's rating from the class mean. This approach allowed us to gain insights into heterogeneous student perceptions of academic support and how they are related to students' motivation and achievement. The analyses were based on a cross-sectional German large-scale assessment of fourth-graders in primary schools ($n = 27530$ students from $n = 1365$ classrooms). To analyze our data, we set up multilevel models with covariates. As idiosyncratic individual student perceptions were of primary interest for the study, all relations were estimated at the individual student level. The results showed that individual levels of students' perceptions of support were positively related to students' motivation. Individual levels of teachers' support and support to classmates were stronger predictors for students' motivation in German than individual levels of receiving support by classmates. Relations between individual levels of academic support and achievement were smaller and not substantial regarding perceived support by teachers.

First assessing then adapting: The role of information processing in accurate teacher judgments

Presenting Author:Katharina Schnitzler, Technical University of Munich, Germany; **Co-Author:**Doris Holzberger, Technical University of Munich (TUM), Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany

Teachers are expected to offer their students personalized instruction tailored to their learning-relevant cognitive and motivational-affective characteristics to support all of them equally in their learning. To get closer to this ideal, teachers need further support, as they are struggling with adaptive teaching practices and even favor strong students over struggling ones—a detrimental behavior that is mirrored in the heterogeneity of students' perceptions of their teachers' practices. To counteract such classroom processes, teachers must first be able to assess student characteristics correctly and then adapt their teaching accordingly. The accurate assessment, however, seems to be a challenging task in itself. To gain a comprehensive understanding of the determinants of accurate judgments, cognitive activities as one component of judgment processes need to be investigated. Therefore, this study examined what information are used by student teacher and how usage of information differs between student teachers with high and low judgment accuracy. Forty-three student teachers observed target students from a short video, assessed the combination of their cognitive and motivational-affective characteristics, and voluntarily noted down the information used for the decisions. All student teachers used sufficient information such as the intensity of student engagement and the knowledge reflected in student answers. Findings from an epistemic network analysis indicate that student teachers with higher judgment accuracy used information in a way that pointed conclusively to specific interplays of cognitive and motivational-affective learning characteristics. Those with a low judgment accuracy had difficulty using distinct combinations of different information.

Session J 3

24 August 2021 17:30 - 18:30

Session Room 3

Single Paper

Teaching and Teacher Education

Teacher Professional Development

Keywords: Content Analysis, Cooperative/Collaborative Learning, Early Childhood Education, Motivation, Pre-service Teacher Education, Qualitative Methods, Reflection, Teacher Professional Development

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 11 - Teaching and Teacher Education

Chairperson: Adar Ben-Eliyahu, University of Haifa, Faculty of Education, Israel

'I have seen it from my home': Young children's perceptions of the 2019 social unrest in Hong Kong

Keywords: Early Childhood Education, Pre-service Teacher Education, Qualitative Methods, Teacher Professional Development

Presenting Author:Caroline Cohrssen, Education Faculty, Hong Kong; **Co-Author:**Nirmala Rao, The University of Hong Kong, Hong Kong

In 2019, Hong Kong SAR experienced a period of sustained social unrest, triggered by the government's plan to pass a law that would allow extradition under some circumstances to mainland China. The extradition bill was withdrawn in September 2019, but the protests continued, becoming increasingly violent. Children's beliefs are informed by interactions with and perceptions of significant role models such as older siblings, parents, teachers and other individuals perceived to have authority in society. This includes police officers. Six months after the protests had ceased, 5 to 6-year old children's perceptions of the social unrest were investigated. Data in the form of children's drawings, and discussions while they drew, show that many children had detailed knowledge of the social unrest. Anger and aggression on the part of protestors and the police are reflected in the children's work. Many children were critical of police conduct and represented protestors as being in need of protection from the police. Parents and teachers have a critical role to play in shaping children's emerging attitudes and beliefs. An important first step is providing opportunities for children to voice their understanding of events that impact on their lives. Teachers and parents may require support in recognising and responding to changes in children that follow exposure to such events.

Student motivation in teacher learning groups

Keywords: Cooperative/Collaborative Learning, Motivation, Pre-service Teacher Education, Teacher Professional Development

Presenting Author:Emmy Vrieling-Teunter, Open University of the Netherlands, Netherlands; **Presenting Author:**Patrick Sins, Thomas More University of Applied Sciences, Netherlands; **Co-Author:**Nicky de Vries, iPabo University of Applied Sciences; Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Marjan Vermeulen, Heerlen Open Universiteit, Netherlands

Student welfare is high on the agenda in the Netherlands due to increasing psychological problems of students in higher education. As a way to address this problem, teacher training institutes involve their students to engage in Teacher Learning Groups (TLGs) to enable them to develop social skills, but also to prevent isolation and loss of motivation. However, not much is known on what aspects in the social configuration of TLGs contribute to optimize students' motivation. Therefore, the present study investigates the relationships between TLGs' social configuration and student motivation. We followed students ($N=55$) for one year in four teacher training institutes in the Netherlands. We used a convergent parallel mixed-methods design in monitoring student experiences of Social configuration (Practice integration, Long term orientation and goals, Shared identity and equal relationships) and Motivation (Autonomy, Relationship and Competence). Our analyses reveal that Shared identity and equal relationships show large, significant correlations with all motivation scales. Based on our analyses of the qualitative interview data, clusters for student motivation become visible: Shared history, Shared identity and Shared skills.

How do prospective teachers define the technical term of reflection?

Keywords: Content Analysis, Pre-service Teacher Education, Reflection, Teacher Professional Development

Presenting Author:Renata Kiss-Kovacs, University of Szeged, Doctoral School of Education, Hungary

Reflection and reflective teaching is expected from teachers nowadays, therefore, reflective thinking should be developed even in teacher education. Although the definition of this term has not been clarified adequately in scientific literature, several different features are highlighted in different contributions. Our research goal is: (1) to identify how prospective teachers define the term reflection in their own words; (2) to find out which level can be perceived mostly, from the elements of a systematic categorization (Van Beveren et al., 2018) -- Personal, Interpersonal or Socio-structural level. Teacher trainees before practicum (N=160) were asked how they interpret reflection. Their response for the open-ended question was volunteer, recorded in an online platform. In summary the results of our content analysis are the following: teacher trainees referred to reflection as a feedback (number of mentions: 21) which is made by 'myself' (43), it can give information for 'myself' (29), and it pertains to activity/ behaviour (30). Based on the model of Van Beveren et al. (2018), responses in Personal level (129) were the most frequent. It is still a question, if reflection is made just alone for only ourselves, then what can prospective teachers do with their reflective thoughts. Can they find a way to orientate their experience onto the future, or will they only ruminate concentrating on the past?

Session J 4

24 August 2021 17:30 - 18:30

Session Room 1

Single Paper

Higher Education

Higher Education

Keywords: At-risk Students, Cultural Diversity in School, Economics of Education, Higher Education, Learning Approaches, Motivation and Emotion, Quantitative Methods, Secondary Data Analysis, Self-efficacy

Interest group: SIG 04 - Higher Education

Chairperson: Sandra Mathers, University of Oxford, United Kingdom

Will they go or will they stay? An integrative approach to model the risky phase of study entrance

Keywords: At-risk Students, Higher Education, Motivation and Emotion, Self-efficacy

Presenting Author:Pascale Stephanie Petri, Justus-Liebig-Universität Giessen, Germany; **Co-Author:**Alexander Minnaert, University of Groningen, Netherlands; **Co-Author:**Martin Kersting, Justus-Liebig-University Giessen, Germany

Education has long been recognized as an essential element in life course. Especially success in higher education has an important influence on the subsequent career path. Hence, successful completion (in contrast to dropout) appears desirable. Unfortunately, dropout rates remain at a relatively high level of ~ 30% in recent years not only in general across OECD countries (OECD, 2016, 2018), but also in specific in Germany (Heublein, 2014). This is considered to be unacceptably high (Heublein et al., 2017). Although there are institutional attempts to intervene, these are usually not scientifically grounded. The discrepancy between scientific insights gained in the field of higher education on the one hand and counseling practices on the other hand calls for action. We therefore compared selected models of student dropout (Lent & Brown, 2013; Neuville et al., 2007; Spady, 1971; Tinto, 1975) theoretically and empirically in their fit to longitudinal data (9 months of study entrance) collected from three cohorts of freshmen. Using data from the first cohort, we compared model fit. Next, we developed a new process model with an integrative theoretical perspective, based on existing models and meta-analytic findings (Richardson, Abraham & Bond, 2012; Robbins et al., 2004). Data from the second and third cohort served for validation purposes. The new model not only revealed a good model fit but also outperformed the others. This allows to propose it as a framework for future research as well as for counseling as it points out the most important aspects highly predictive for dropout.

Predicting diverse students' self selection from higher education: A systematic review

Keywords: Cultural Diversity in School, Economics of Education, Higher Education, Secondary Data Analysis

Presenting Author:Marieke Meeuwisse, Erasmus University Rotterdam, Netherlands; **Co-Author:**Jana Vietze, Erasmus University Rotterdam, Netherlands; **Co-Author:**Sanne van Herpen, Erasmus University Rotterdam, Netherlands; **Co-Author:**Aike Dias-Broens, Erasmus University Rotterdam, Netherlands; **Co-Author:**Reinilde Pulinx, Erasmus Universiteit Rotterdam, Netherlands; **Co-Author:**Sabine Severiens, Erasmus University Rotterdam, Netherlands

Self selection describes the decision of students graduated from secondary school to not continue in higher education despite having the necessary formal qualifications. In this study, we synthesize findings from ten international research reviews on higher education access and enrollment to identify facilitating factors and barriers that affect individual students' self selection. Based on the theoretical framework by Perna (2006), our narrative synthesis indicates a variety of interacting factors on the individual, community, higher education, and socio-political level. In line with human capital theory, we identified differences in access to social and cultural capital between overrepresented and underrepresented student groups in higher education. Importantly, findings highlight that first-generation and cultural minority students may have higher stakes but also higher incentives to decide for the pathway into higher education compared to their non-first generation and majority peers.

Relationship between students' burnout profiles, study processes and academic achievement

Keywords: At-risk Students, Higher Education, Learning Approaches, Quantitative Methods

Presenting Author:Nina Katajavuori, University of Helsinki, Finland; **Co-Author:**Juuso Henrik Nieminen, University of Eastern Finland, Finland; **Co-Author:**Jokke Hässä, University of Helsinki, Finland; **Co-Author:**Henna Asikainen, University of Helsinki, Finland

Higher education students are feeling worse than before and growing mental problems are a serious concern in universities. The way students learn is related to their experiences of study-related burnout, but research about study-related burnout among university students is scarce. The aim of this study was to explore first-year students burnout profiles and how they relate to students' processes of understanding, organised studying and academic achievement. A total of 538 first-year life science students participated to this study. Confirmatory factory were conducted to the scales analysis and latent profile analysis was used to analyse differet profiles.. The results showed that students' study processes were related to study-related burnout.The five-profile solution was chosen to represent the best fit to the data, and the profiles were named *Interested students*, *Interested ineffectacious students*, *Interested exhausted students*, *At risk students* and *Burned out students*. There were statistically significant differences between the profiles in students' study processes and study success showing that interested students scored higher on the deep approach than students in the other profiles ($p < 0.001$). Burned-out students and Exhausted and ineffectacious students scored higher on the surface approach to learning than students in the other profiles ($p < 0.001$). This study shows that students learning processes are related to well-being and success in studies, and thus, should be taken account in higher education. Understanding of different student profiles may help to design teaching and to support different students' profiles learning.

Session J 5

24 August 2021 17:30 - 18:30

Session Room 10

Single Paper

Assessment and Evaluation, Developmental Aspects of Instruction, Instructional Design

Comprehension of Text and Graphics

Keywords: Comprehension of Text and Graphics, Developmental Processes, Educational Psychology, Experimental Studies, Instructional Design, Literacy, Reading Comprehension

Interest group: SIG 02 - Comprehension of Text and Graphics

Chairperson: Karl-Heinz Pogner, Copenhagen Business School, Denmark

The impact of text position and (un)resolved conflict between texts on online processing and recall

Keywords: Comprehension of Text and Graphics, Experimental Studies, Instructional Design, Reading Comprehension

Presenting Author: Anne Schueler, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:** Yvonne Kammerer, Leibniz-Institut für Wissensmedien (IWM); International School of Management, Germany; **Co-Author:** Daniela Becker, Behavioral Science Institute Nijmegen, Netherlands

Two experiments are reported, in which participants were presented with two texts conveying conflicting explanations on how the eye of Africa developed. We investigated the influence of text position (first vs. second text presented) and conflict between texts (unresolved conflict vs. conflict resolved at the beginning of the second text vs. conflict resolved at the end of the second text) on recall and online processing of both texts. In Experiment 1 ($N = 201$), an eye-tracking lab experiment, the two texts were presented simultaneously. Results revealed that the text read first was better recalled and also processed more intensively than the second text. Regarding open recall, these findings could only be mitigated (but not reversed) if learners were told at the beginning of the second text that the first text was outdated. The aim of Experiment 2 ($N = 161$), which was conducted online, was to corroborate these exploratory findings. This time, the two texts were presented sequentially. Again, participants recalled the first text better than the second text and dedicated more reading time to the first text. In contrast to Experiment 1, resolving conflict at the beginning of the second text did not mitigate the advantage for the first text for open recall. In sum, the results indicate that the first information read has a strong influence on processing and recall, even if learners are told that the first information is outdated. This finding is discussed with regard to the continued-influence effect and its implications for internet search.

Digital and Printed Text Comprehension in First Graders: The role of Medium and Word Reading Skills

Keywords: Comprehension of Text and Graphics, Educational Psychology, Literacy, Reading Comprehension

Presenting Author: Lucia Mason, University of Padova, Italy; **Co-Author:** Elena Florit, University of Verona, Italy; **Co-Author:** Pietro De Carli, University of Padova, Italy

Recent meta-analyses of studies mainly involving university and high-school students share the outcome that reading comprehension is higher on paper than on screen for informational texts. This study investigated the contribution of relevant text and task variables (medium and level of comprehension assessed) and reader's characteristics (word reading skills) to text comprehension in beginner readers. Specifically, the study examined whether a comprehension disadvantage would also emerge for digital-based reading in beginner readers with experience in using technology for learning in school. First graders ($N=115$) read four texts, one narrative and one informational, both on paper and on screen. Text comprehension was measured at three levels: main point, literal comprehension, and inferential comprehension. Results showed that for comprehension of the main point, greater performance was related to reading on screen and to higher word reading skills. For literal comprehension, greater performance was also associated with digital reading and better word reading, as well as with the interaction of the two variables. Finally, for deeper inferential text comprehension, greater performance was related to higher word reading skills and their interaction with reading on screen. Thus, in beginner readers a disadvantage for reading comprehension on screen did not emerge. Rather, an advantage for digital-based reading was revealed in more superficial text comprehension.

The Development of Reading Fluency from Grade 2 to 4

Keywords: Developmental Processes, Experimental Studies, Literacy, Reading Comprehension

Presenting Author: Guido Nottbusch, University of Potsdam, Germany; **Co-Author:** Sabine Röttig, University of Potsdam, Germany

How does reading fluency develop? How accurate, fast and expressive do children read in the different grades of Primary School? Actually, there is a lack of studies and methods providing reference values allowing for evaluation of reading fluency per grade level in Primary School (at least for German). Therefore, we started a longitudinal study beginning at the end of grade 2 (up to grade 6) and we'd like to present intermediate results until the end of 4th grade. Based on several audio recordings (running records) of 196 children at the end of each grade (142 after drop out), we graded decoding accuracy, automaticity, reading speed and prosodic achievement individually. Our results reveal the chronological progression and the interplay of these dimensions of reading fluency and we describe typical patterns of development.

Session J 6

24 August 2021 17:30 - 18:30

Session Room 11

Single Paper

Assessment and Evaluation, Higher Education

Psychometrics

Keywords: Assessment Methods and Tools, Educational Technology, Higher Education, Motivation, Psychometrics, Quantitative Methods, Social Sciences

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education, SIG 27 - Online Measures of Learning Processes

Chairperson: Joni Lämsä, University of Jyväskylä, Finland

Detecting Differential Rater Functioning in Severity and Centrality

Keywords: Assessment Methods and Tools, Psychometrics, Quantitative Methods, Social Sciences

Presenting Author: Kuan-Yu Jin, Hong Kong Examinations and Assessment Authority, Hong Kong; **Co-Author:** Thomas Eckes, TestDaF Institute, University of Bochum, Germany

Performance assessments heavily rely on human raters' judgment. To ensure unbiased assessment outcomes, accurate and fair ratings are required. Differential rater functioning (DRF) is a kind of threat to fairness manifesting itself in unwanted interactions between raters and performance- or construct-irrelevant factors (e.g., examinee gender, rater experience, or time of rating). Most often, DRF studies have focused on whether or not raters show differential severity toward different groups of examinees. This study expands the DRF framework and investigates the more complex case that DRF is simultaneously present in severity and centrality effects. This class of rater effects is called dual DRF effects. We conducted two simulation studies to examine (1) the impact of ignoring dual DRF effects on examinees' ranking orders and (2) the extent to which dual DRF effects can be correctly detected under varied conditions. Findings have implications for practitioners and researchers when assessing the psychometric quality of ratings.

Eyeing Up Virtual Reality for Healthcare Training: Using Pupilometry to Assess Cognitive Load

Keywords: Assessment Methods and Tools, Educational Technology, Higher Education, Psychometrics

Presenting Author: Joy Yeonjoo Lee, Maastricht University, Netherlands; **Co-Author:** Nynke de Jong, Health Services Research, Faculty of Health, Medicine, and Life Sciences, Maastricht University, Netherlands; **Co-Author:** Jeroen Donkers, Maastricht University, Netherlands; **Co-Author:** Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands; **Co-Author:** Jeroen Van Merriënboer, Maastricht University, Netherlands

Pupilometry is known as a reliable technique to measure cognitive load in healthcare training. However, its applicability to virtual reality (VR) environments, an emerging technology for simulation-based training, has not been validated. Specifically, identifying task-evoked pupillary responses (TEPRs) from light reflexes caused by the VR display is an issue in the research progress. Addressing these methodological challenges, the authors validated whether TEPRs are predicted by cognitive load from task difficulty and correlate with a cognitive load self-rating and performance measures. In 2020, the authors recruited 14 students in health sciences. They performed observation tasks in two conditions: difficult versus easy tasks, whilst watching a VR scenario in the domain. Then, a cognitive load self-rating ensued. The authors used a VR system with built-in eye-tracker and a custom-made photo sensor to assess pupil diameter and light intensity during the scenario. Employing a method from human computer interaction field, they determined TEPRs by modelling the pupil light reflexes using a baseline. The difficult task caused significantly larger TEPRs than the easy task. The self-rating correlated with TEPRs, yet it did not show statistically significant difference between the two tasks. Only in the difficult task condition, TEPRs positively correlated with two performance measures: task score and report length. Pupil diameter was verified as a measure of cognitive load in VR training. Future studies should test our findings with bigger sample size, in different domains, involving complex VR functions such as haptic interaction.

The Spanish intrinsic and extrinsic motivation scales of the MSLQ: Psychometrics by Rasch models

Keywords: Assessment Methods and Tools, Higher Education, Motivation, Psychometrics

Presenting Author:Tine Nielsen, UCL University College, Denmark; **Co-Author:**Inmaculada Martínez-García, University of Cadiz, Spain; **Co-Author:**Enrique Alastor, Universidad de Cádiz, Spain

The aim was to conduct a validity study to ascertain the psychometric properties of the Spanish translation of the intrinsic and extrinsic motivation (IM and EM) subscales of the Motivated Strategies for Learning Questionnaire with the modified response scales validated in the Danish higher education context. The items of the IM and EM scales were translated using a forward-backward approach, as where the response scales. To compare the psychometric properties to the only European validity study of the scales using Rasch measurement models, the ordinal Rasch model (RM) and graphical loglinear Rasch models (GLLRM) were employed. To extend on the findings of the previous study, emphasis was on measurement invariance (i.e. no differential item functioning) relative to courses attended and university. The sample consisted of 875 Psychology students enrolled in the same four subject courses of the Bachelor in Psychology programs at two major Spanish Universities. Data was collected in class one month into the courses. Neither the IM or the EM scale fit the pure RM. The IM subscale fit a GLLRM including DIF relative to course targeted on one item and local dependence between two items. The EM subscale fit a GLLRM including DIF relative course targeted for one item, DIF relative to gender for another item and local dependence between two items. Targeting and reliability varied for subgroups defined by DIF variables. Reliability was low for most subgroups on both subscales. Targeting was good for the EM subscale, while poor for most subgroups on the IM subscale.

Session J 7

24 August 2021 17:30 - 18:30

Session Room 13

Single Paper

Higher Education

Teaching and Instruction

Keywords: Content Analysis, E-Learning/Online Learning, Higher Education, Qualitative Methods, Synergies between Learning; Teaching and Research, Teaching Approaches, Teaching/Instruction

Interest group: SIG 04 - Higher Education, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Jessica To, National Institute of Education, Nanyang Technological University, Hong Kong

Towards reshaping the future with online instruction: Nigeria teachers' experiences in COVID-19 era

Keywords: Content Analysis, E-Learning/Online Learning, Qualitative Methods, Teaching/Instruction

Presenting Author:Rachel Atomatofa, Delta State College of Education, Mosogar, Nigeria

The outbreak of the Corona Virus in February 2020 in Nigeria led to the emergency shutting down of schools for over 6 months. This brought about lot of experiences from various teachers (Public/Private, Rural/Urban and; Male/Female). Before the shutting down of schools, most teachers were only used to face to face classroom instruction. This qualitative study guided by four research questions, analysed the experiences of different categories of teachers in online instruction during the COVID-19 era as a means of reshaping the future of Nigeria. It employed the case study design where the purposive sampling was used to select 60 primary school teachers that met with selection criteria, across Delta State. The main instrument used was structured interview method. The researcher collected information through direct contact with the teachers. Their responses formed the data which were categorized according to the research questions. Content analysis method at the basic level and descriptive statistics were used to analyse the data and answer the research questions. Results showed that the shutting down of schools has forced most teachers irrespective of their category to begin to access the internet and participate in online instructions though at different levels. The urban-private school teachers were the greatest that participated and had more experiences in online instruction. The public and private rural teachers were still way backward as at the time of this research hence recommendations were made towards shaping the future of Nigeria through more online learning and instruction for all teachers.

Pedagogical use of exemplars in higher education: A systematic review

Keywords: Higher Education, Synergies between Learning; Teaching and Research, Teaching Approaches, Teaching/Instruction

Presenting Author:Jessica To, National Institute of Education, Nanyang Technological University, Hong Kong; **Co-Author:**Ernesto Panadero, Universidad Deusto, Spain; **Co-Author:**David Carless, University of Hong Kong, United Kingdom

Exemplars are pedagogical tools that aim to increase student understanding of assessment standards and criteria while enhancing academic performance. However, they have also raised concerns about copying and inhibition of creativity. To clarify the implementation of exemplars and their educational effects, this review synthesises the empirical studies using exemplars in higher education. The search for exemplar studies on PsycINFO and ERIC databases finally resulted in 44 papers for this review. The findings showed that exemplars were used in a wide range of subjects for assignment preparation in the junior years of undergraduate classrooms. Two to three exemplars of varied quality were frequently utilised in tandem with rubrics to illustrate assessment standards. Exemplar dialogue was implemented in two major ways: (i) exemplar marking followed by peer and / or teacher-student discussion of exemplars; (ii) students' production of first draft preceding exemplar discussion and comparison of their draft with exemplars. Dialogic use of exemplars together with rubric deconstruction and students' self-assessment of work-in-progress was found useful in improving their academic performance, understanding of task requirements and confidence in assignment preparation, although the research evidence did not point out which activity was most influential in bringing about the improvement. The significance of this review lies in outlining the pedagogical strategies of exemplar use in higher education and delineating the cognitive and meta-cognitive processes for productive use of exemplars.

Defining mentoring in higher education: a systematic literature review

Keywords: Content Analysis, Higher Education, Teaching Approaches, Teaching/Instruction

Presenting Author:Wendy Nuis, Maastricht University, Netherlands; **Co-Author:**Simon Beausaert, Maastricht University, Netherlands

Technology advances, macro-economic trends, and an increasingly diverse student population pose challenges on higher education. To keep up with the required skill sets and to address individual student needs, personalized learning has become an important mean. Nowadays, mentoring is regarded as a suitable approach to support personalized learning, and a large variety of mentoring programs are implemented. However, empirical research on mentoring in higher education often lacks a theoretical foundation. Existing literature reviews demonstrated that a clear and consistent mentoring definition is lacking, and that current mentoring research shows methodological weaknesses (e.g. validity issues of measurements). Therefore, this study aimed to (1) propose a holistic definition, and (2) provide an overview of the existing mentoring measures through a systematic literature review. The literature search was conducted in October 2020 and yielded 1661 articles. Several inclusion and exclusion criteria were used and a critical appraisal was performed, resulting in a final sample of 106 studies. Excel and NVivo 11 were used to extract and code the data, and summative content analyses and co-occurrence analyses were performed subsequently. The data analysis led to the formulation of a holistic definition of mentoring, containing five distinct mentoring characteristics. Furthermore, a limited number of existing, validating measures was identified containing various subscales. Consequently, this study is the first to establish a holistic definition, thereby creating a strong theoretical basis for empirical follow-up studies and for researchers aiming to develop and validate a new instrument. In addition, it can support practitioners to design evidence-based mentoring programs.

Session J 8

24 August 2021 17:30 - 18:30

Session Room 14

Single Paper

Motivational, Social and Affective Processes

Motivation and Self-Regulation

Keywords: Educational Psychology, Higher Education, Motivation, Secondary Data Analysis, Self-regulation, Social Development, Teaching/Instruction

Interest group: SIG 08 - Motivation and Emotion, SIG 27 - Online Measures of Learning Processes

Chairperson: Bart Rienties, Open University, United Kingdom

Interplay between parents' and children's basic psychological need satisfaction

Keywords: Motivation, Secondary Data Analysis, Self-regulation, Social Development

Presenting Author: Vanessa Kurdi, University of Reading, United Kingdom; **Co-Author:** Noriaki Fukuzumi, Kochi University, Japan; **Co-Author:** Ryo Ishii, Nara University of Education, Japan; **Co-Author:** Ayame Tamura, Doshisha University, Japan; **Co-Author:** Naoki Nakazato, Oita University, Japan; **Co-Author:** Kazuhiro Ohtani, Hokkaido University, Japan; **Co-Author:** Shin-ichi Ishikawa, Doshisha University, Japan; **Co-Author:** Takashi Suzuki, Kochi University of Technology, Japan; **Co-Author:** Michiko Sakaki, University of Reading, United Kingdom; **Co-Author:** Kou Murayama, University of Reading, United Kingdom; **Co-Author:** Ayumi Tanaka, Doshisha University, Japan

According to Self-Determination Theory, humans have three basic psychological needs: autonomy, competence and relatedness (Ryan & Deci, 2000). While research on romantic relationships and friendships is examining the interplay of basic need satisfaction (BNS) between dyad members, research on BNS interplay within parent-child dyads remains scarce. Some studies have found that parents' BNS was correlated with their children's BNS (e.g., Wuyts et al., 2018), but none to our knowledge has determined how they were related to each other over time, and if these associations were explained by the use of autonomy-supportive or controlling parenting practices. We investigated these questions in two Japanese samples with two time points (T1 and T2): (i) 200 parent (78% mothers) and child (55% girls; $M_{age} = 14$) dyads; (ii) 408 mother and child (52% girls; $M_{age} = 14$) dyads. In both samples, parents reported their own BNS and their perception of their child's BNS, children reported their own BNS, and parents and children each reported the parent's autonomy-supportive and controlling parenting practices. Findings from cross-lagged path models for autonomy, competence, and relatedness show that the parent's T1 perception of their child's BNS predicted their child's T2 self-reported BNS. Mediation analyses showed no indirect effects through autonomy-supportive or controlling parenting practices. The findings highlight the importance of the perceptions parents have of their adolescents, which may benefit the design of new interventions on BNS.

Student questioning and perceived teacher support: Online vs in-person classes in the COVID-19 era

Keywords: Higher Education, Motivation, Self-regulation, Teaching/Instruction

Presenting Author: Eleftheria Gonida, Aristotle University of Thessaloniki, Greece; **Co-Author:** Stuart Karabenick, University of Michigan, United States

Although digital technologies were extensively used in higher education before the pandemic, education was highly disrupted last spring. However, from a research point of view, COVID-19 pandemic provided a unique opportunity to compare the face-to-face instructional context with the online context for the same course taught by the same instructor. The present study aimed to study student questioning in the class in relation to perceived teacher support of questioning and threat in the in-person and online instructional context before and after the pandemic. Moreover, course interest and academic efficacy were co-examined. Student questioning constitutes a form of academic help seeking as a self-regulated learning strategy and previous evidence has indicated that perceived teacher support affects the likelihood of seeking help and perceived threat to one's self esteem is associated with avoidance of help seeking. A sample of 408 university students (240 females) attending both STEM and non-STEM programs participated in an online survey. Measures included the following variables: student questioning, perceived teacher support/non-support of questioning, perceived threat to address questions, course interest and academic efficacy. Student questioning was more frequent in the in-person than the online context although perceived teacher support for questioning was significantly higher in the online context and perceived threat to address questions was higher in the in-person context. The results for academic efficacy and course interest were consistent to theory-based hypotheses. Findings will be discussed in relation to current theory and evidence taking also into account the COVID-19 disruption and practical implementations will be pointed out.

Effort and Learning-Related Choices: the Impact of Sympathetic Activity and Ability Beliefs

Keywords: Educational Psychology, Higher Education, Motivation, Self-regulation

Presenting Author: Smiddy Nieuwenhuis, VU University Amsterdam, Netherlands; **Co-Author:** Tieme Janssen, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:** Denise van der Mee, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:** Martijn Meeter, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:** Nienke van Atteveldt, Vrije Universiteit Amsterdam, Netherlands

Previous research shows that some students view their abilities as malleable with effort and aim to improve themselves (incremental beliefs), while others believe abilities are fixed and cannot change with effort and aim to prove themselves (entity beliefs). Here, we investigated how such beliefs in undergraduates ($n=115$) relate to their effort investment during a challenging arithmetic task, indexed by 1) whether they make low vs high effort learning-related choices (easy vs difficult problems) 2) sympathetic activity measured with impedance cardiography as physiological measure of effort. Results show that incremental theorists chose relatively higher difficulty levels compared to entity theorists. Moreover, higher effort, as indexed by higher sympathetic activity, was associated with subsequently choosing lower difficulty levels. This effect was stronger for entity theorists than incremental theorists, indicating that they seemed more inclined to avoid higher sympathetic activity, in line with our finding that entity theorists reported more helplessness attributions.

Session J 9

24 August 2021 17:30 - 18:30

Session Room 17

Single Paper

Instructional Design, Teaching and Teacher Education

Quasi-experimental Research

Keywords: Comprehension of Text and Graphics, E-Learning/Online Learning, Early Childhood Education, Educational Psychology, Quasi-experimental Research, Self-regulation

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 05 - Learning and Development in Early Childhood, SIG 06 - Instructional Design

Chairperson: Kamila Urban, Slovakia

Strategical learning with text-picture-combinations: learning strategy or learning technique?

Keywords: Comprehension of Text and Graphics, Educational Psychology, Quasi-experimental Research, Self-regulation

Presenting Author: Sabine Schlag, University of Wuppertal, Germany

Learning with text and pictures as well as cognitive strategies for learning with text proved beneficial for learning. Not many approaches have proposed cognitive learning strategies for text-picture combination. On account of learners who often struggle with complex text-picture-combinations (Ainsworth, Bibby & Wood, 2002), we developed a cognitive strategy for learning with text and picture, which significantly increased the learning outcome from sixth-grade students in two studies (Schlag & Ploetzner, 2011, 2013). Klauer (2011) however states that combining techniques to a complex learning strategy might not always lead to enhanced learning success compared to the single technique due to inferences between the techniques. Furthermore complex strategies have shown to be time consuming in training and did not always show appropriate higher learning success (e.g. Scheiter, Schubert, Gerjets & Stalbovs, 2015). The complex strategy was systematically broken down into single techniques (label, summarize, draw) and combinations of two techniques (label & summarize, label & draw, summarize & draw). In this study each single technique and each combined technique were compared to the complex learning strategy in a quasi-experimental

study with sixth-grade students. The results of all seven groups are recently analysed and will be presented on the conference.

The impact of verbal fluency on the effect of a self-regulated learning training

Keywords: Early Childhood Education, Educational Psychology, Quasi-experimental Research, Self-regulation

Presenting Author:Nathalie Zetzmann, Saarland University, Germany

The aim of this quasi-experimental study with $N = 275$ pre-schoolers was to examine the impact of verbal fluency (VF) on the effect of a training intervention to foster self-regulated learning (SRL) in pre-school. Two intervention groups (SRL, SRL with language focus) were created based on Zimmerman's cyclical model of SRL (2000) and were compared to an active control group (CG). It was hypothesized that there would be an improvement in SRL for both intervention groups compared to the CG. Furthermore, a positive relation between SRL and VF was expected which lead to the hypothesis that children with high VF would outmatch children with low VF regarding SRL in pre- and posttest. In contrast to the assumption, an ANCOVA (controlled for SRL pretest scores) showed no differences between the groups regarding SRL in the posttest ($p = .31$). In accordance to the hypothesis, there was a positive correlation between SRL and VF in the pretest ($r = .34$, $p < .05$).

Impact of Visual Complexity of Instructional Materials on the Split-Attention Effect

Keywords: Comprehension of Text and Graphics, E-Learning/Online Learning, Educational Psychology, Quasi-experimental Research

Presenting Author:Shirong Zhang, Erasmus University Rotterdam, Netherlands; **Co-Author:**Tatjana Fincke, Erasmus University Rotterdam, Netherlands; **Co-Author:**Bjorn de Koning, Erasmus University Rotterdam, Netherlands; **Co-Author:**Fred Paas, Erasmus University Rotterdam/University of Wollongong, Netherlands

This study investigated the impact of visual complexity of mutually referring yet spatially separated text and picture materials (i.e., split-attention materials) on learning and cognitive load. We extended prior research which has mainly focused on studying the effects of the *cognitive complexity* of split-attention materials. In this study, *visual complexity* was manipulated by changing the color of the instructional materials, with colored and black-and white text-picture materials representing low and high visual complexity, respectively. In a 2 (Format: split-attention vs. integrated) \times 2 (Visual Complexity: high vs. low) between-subjects design, ninety-two university students were randomly assigned to a condition with learning materials presented in a split-attention format or an integrated format, both of which could be presented in a high or low complexity version. After a self-study phase, learning outcomes (retention, comprehension) and mental effort were measured. Neither format or visual complexity had a significant impact on learning outcomes and there was also no significant interaction. For mental effort, participants in the split-attention conditions perceived higher mental effort in studying the materials than participants in the integrated conditions irrespectively of visual complexity. There was a significant interaction indicating that mental effort was higher for solving the comprehension questions for participants who studied split-attention materials with high-complexity than those studied integrated materials with high complexity. Results suggested that visual complexity could play a role in the split-attention effect and further research is needed to investigate this role.

Session J 10

24 August 2021 17:30 - 18:30

Session Room 2

Single Paper

Developmental Aspects of Instruction, Teaching and Teacher Education

Video Analysis

Keywords: Assessment Methods and Tools, In-service Teacher Education, Model-based Reasoning, Pre-service Teacher Education, Qualitative Methods, Video Analysis

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Robin Göller, Leuphana University Lüneburg, Germany

Analysing pre- and in-service teachers' feedback practices in a standardized microteaching setting

Keywords: Assessment Methods and Tools, In-service Teacher Education, Pre-service Teacher Education, Video Analysis

Presenting Author:Marc Kleinknecht, Leuphana University Lüneburg, Germany; **Co-Author:**Anna Holstein, Leuphana University Lüneburg, Germany; **Co-Author:**Kira Elena Weber, Leuphana University Lüneburg, Germany; **Co-Author:**Christopher Neil Prilop, Leuphana University Lüneburg / University of Hamburg, Germany

In educational research, feedback is considered a powerful tool to enhance student learning and achievement. It is most effective when it equips learners with the necessary process skills to construct meaning themselves or self-regulate their learning efforts. However, research shows that teachers rarely give feedback and if they do, it is mostly task-related and less often contains aspects about the process or self-regulation. With regard to effective feedback practices, teaching experience could play a role. However, there are no studies that compare pre-service teachers' with in-service teachers' feedback practices. To close this research gap, we analyzed and compared feedback practices of in- and pre-service teachers in an authentic, standardized learning situation. These microteachings took place with trained grammar school students and the participants ($n = 56$, 34 in-service and 22 pre-service teachers) acted authentically. The microteachings were videotaped and coded. The results indicate that both, in- and pre-service teachers give significantly more feedback about the task than feedback about the process and self-regulation. At the same time, in both groups, feedback about the process occurred significantly more often than feedback about self-regulation. The latter hardly occurred at all. As for the comparison between the two groups, no major statistical differences were found. We conclude that feedback practices do not automatically develop in the course of a teacher's career, but need to be fostered continuously.

Unraveling novices' PPK and PCK professional vision: A comprehensive video-analysis coding scheme

Keywords: Model-based Reasoning, Pre-service Teacher Education, Qualitative Methods, Video Analysis

Presenting Author:Meg Farrell, Technische Universität München, Germany; **Co-Author:**Monika Martin, Albert-Ludwigs-Universität Freiburg, Germany; **Co-Author:**Alexander Renkl, Albert-Ludwigs-Universität Freiburg, Institut für Psychologie, Germany; **Co-Author:**Werner Rieß, Pädagogische Hochschule Freiburg, Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany

Academic professional training (e.g. teaching) involves learning common practices through gradually increased authentic application (Grossman, 2018). In teacher training, video-analyses represent such approximations-of-practice, which support the development of a key teaching component: professional vision (PV) (Goodwin, 1994). Practitioners can support teacher-students' PV development through video-analysis assessment. The nature of video-analysis usually involves written reflections, calling for qualitative evaluation. Corresponding coding schemes are typically unique instruments, measuring specific phenomena within the constraints of task designs and goals. However, the time-costs of individually assessing increasingly complex tasks may outweigh its benefits. The present study aims to develop a qualitative coding instrument for researchers' and practitioners' larger-scale use by asking: What PV indicators demonstrate meaningful components for assessing teacher-students' video-based analysis of teaching strategies (PPK and PCK), in terms of describing and interpreting relevant noticed events? The development followed qualitative content analysis methodology (Mayring, 2014), deductively defining relevant PV categories and indicators with a literature review, then pilot testing them with data from a video-analysis study. Our results propose a coding instrument comprising two PV subskills: *Describing* and *Interpreting*, further divided into 10 content and 2 quality indicators. Inter-rater reliability ranged from substantial to strong. A coding scheme for researchers and teacher-educators that includes common theoretically-oriented PV indicators should make it flexibly applicable to various (biology) video-analysis contexts, while also providing differentiation in scope for sensitivity to variations in teacher-students' skill proficiency. Next steps include instrument validation with different video-analysis studies. Future additions could include PV indicators for more complex approximations-of-practice.

Session J 11

24 August 2021 17:30 - 18:30

Session Room 4

Single Paper

Assessment and Evaluation

Assessment, Evaluation and Quantitative Methods

Keywords: Argumentation, Arts, Assessment Methods and Tools, Cognitive Skills, Conversation/Discourse Analysis, Cooperative/Collaborative Learning, Higher Education, Quantitative Methods

Interest group: SIG 01 - Assessment and Evaluation, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Laura Messerer, University of Mannheim, Germany

Correlation of visual and spatial skills, combinatorial and divergent thinking of adolescents

Keywords: Arts, Assessment Methods and Tools, Cognitive Skills, Quantitative Methods

Presenting Author: Attila Pásztor, MTA-SZTE Research Group on the Development of Competencies, Hungary; **Co-Author:** Bernadett Babály, Óbuda University Ybl Miklós Faculty of Architecture, and Civil Engineering and Doctoral School of Education, Eötvös Loránd University, Hungary; **Co-Author:** Tünde Simon, Hungarian University of Fine Arts Visual Education Department, Hungary; **Co-Author:** Alisa Tóth, Károli Gáspár University of the Reformed Church in Hungary, Faculty of Teacher Training, and Visual Culture Research Group of the Hungarian Academy of Science and ELTE University, Hungary; **Co-Author:** Andrea Kárpáti, Corvinus University of Budapest, Institute of Communication and Sociology, and Visual Culture Research Group of the Hungarian Academy of Science and ELTE University, Hungary

Visual competencies and thinking skills are both increasingly important in the 21st century. Therefore, fostering them through tasks embedded in visual art tasks could be a promising endeavour. In order to develop efficient intervention programs knowledge about the relationship of visual and thinking skills is necessary. The aim of the study is to describe the relationships of visual and spatial skills, combinatorial and divergent thinking in Grade 5 and 9. The sample for the study was drawn from fifth- (N=301) and ninth-grade (N=320 students (age M_{fifth}=11.5; M_{ninth}=15.7). Online instruments were used for assessment. The visual communication test measured visual recognition and interpretation, symbolization, abstraction, modality change, colour and shape perception, and colour memory. The spatial tasks assessed visualization, reconstruction of space, space orientation, mental rotation. The combinatorial thinking test comprised 8 tasks for both Grades that required the enumeration of all constructs under predefined conditions. Divergent thinking was assessed through alternative uses and picture meaning tasks. We found significant correlations between all test results. Most of the coefficients are greater in Grade 9 than Grade 5. Combinatorial thinking had stronger correlations with visual and spatial skills than divergent thinking. The correlation between combinatorial skills with visual and spatial skills are similar in magnitude than those among the two domains in the visual arts realm: visual and spatial perception. Our results show the significance of harmonised development of thinking and visual/spatial skills, implying that art education may have a significant developmental effect far beyond the cultivation of aesthetic sense.

Evaluating the effectiveness of peer assessment moderation to influence teamwork behavior

Keywords: Assessment Methods and Tools, Cooperative/Collaborative Learning, Higher Education, Quantitative Methods

Presenting Author: Bhavani Sridharan, Australian Catholic University, Australia; **Co-Author:** David Boud, University of Technology Sydney/ Deakin University, Australia; **Co-Author:** Jamie Mustard, Deakin University, Australia

The importance of group-based learning (GBL) in preparing students for the future world of work cannot be understated owing to its potential in developing gamut of soft skills. While scholars have highlighted the power of peer assessment in deterring undesirable behaviours, they have also identified limitations owing to inhibitions around honesty and accuracy, particularly in a summative assessment context. The moderation of peer assessment can offer an effective solution; however, its efficacy depends on the extent to which it affects students' final performance outcomes and influences consequential learning. Research exploring how various peer assessment moderation models influence GBL scores and the boundary conditions around this relationship is sparse. Therefore, this study seeks to evaluate the effectiveness of peer moderation models (linear, non-linear, and curvilinear) on achievement and whether all groups are affected equally.

Paired t-test and multifactor analysis of variance (ANOVA) methods were adopted using 657 students' retrospective achievement scores and peer assessment ratings to fulfil research objectives. The t-test results suggest the curvilinear moderation model is effective in differentiating students with good and poor team behaviours. ANOVA analysis for difference between groups indicated this model is most effective for mature-aged students, on-campus students and low and mediocre individual performers.

This study proposes the need for developing evaluative judgement and teamwork skills especially for commencing, off-campus and low performing students. The study also suggests the adoption of a nuanced moderation model to have a significant impact on the consequential learning of students.

In search of the lingua franca of classroom discourse quality assessments

Keywords: Argumentation, Assessment Methods and Tools, Conversation/Discourse Analysis, Quantitative Methods

Presenting Author: Edith Bouton, Hebrew University of Jerusalem, Israel; **Co-Author:** Christa Asterhan, Hebrew University of Jerusalem, Israel

Based on decades of research and development, scholars of dialogic learning and teaching are in agreement about what is considered academically productive dialogue (APD) in classrooms. Yet, in spite of this conceptual consensus, there is considerable diversity and variability in the way these dialogue features are captured operationally. These differences hinder efforts to compare results across studies, and to communicate them effectively. Moreover, they raise questions about construct validity. One major point of contention is the pay-off between accurately capturing in-depth the many facets of discourse, while safe-guarding reliability of measurements. In this paper, we report on our efforts to distill the core elements that make up the differently named coding categories used to assess discourse quality in seven different renowned coding tools. Through several iterations of comparison and deconstruction, we identified nine core elements, called *building blocks* (BB). Each turn of classroom talk is coded for the appearance of each of these nine, independently coded, low inference BB. A particular advantage is that these BBs can also be combined to recreate dozens of more complex, higher-order features of classroom talk. The BB scheme is shorter than the shortest scheme reviewed here yet is able to recreate more categories than the longest scheme reviewed. While not entirely resolving the validity vs. reliability tension, this approach ensures rich analysis opportunities, while using a relatively parsimonious and reliable coding scheme.

Session J 12

24 August 2021 17:30 - 18:30

Session Room 5

Single Paper

Teaching and Teacher Education

Citizenship Education for Pre-service Teachers

Keywords: Attitudes and Beliefs, Case Studies, Citizenship Education, Competencies, Environmental Education, In-service Teacher Education, Pre-service Teacher Education

Interest group: SIG 11 - Teaching and Teacher Education, SIG 13 - Moral and Democratic Education

Chairperson: Krzysztof Krejtz, Poland

Investigating teachers' perceptions of environmental citizenship: A systematic review

Keywords: Citizenship Education, Environmental Education, In-service Teacher Education, Pre-service Teacher Education

Presenting Author: Yiannis Georgiou, Cyprus University of Technology / Cyprus Center for Environmental Research & Education, Cyprus; **Co-Author:** Andreas Hadjichambis, Cyprus Center for Environmental Research & Education, Cyprus; **Co-Author:** Demetra Hadjichambi, Cyprus Center for Environmental Research & Education, Cyprus

Abstract As we are living amid an unprecedented environmental crisis, the need to cultivate environmental citizenship in students intensifies. Teachers are considered as the main driving force in fostering students' environmental citizenship. However, a critical question is whether teachers' perceptions of environmental citizenship are well-informed. There is an urgent need to investigate teachers' perceptions, considering their crucial role in the formation of students' environmental citizenry. This study examines teachers' perceptions of environmental citizenship through a systematic review and thematic analysis of relevant empirical studies. The selected studies were published during the timespan of the last thirty (30) years (1990-2020) in high quality peer-reviewed journals. The thematic findings of this review revealed that teachers' perceptions: (a) manifest a relatively decreased understanding of environmental citizenship, (b) are narrowed down to the local scale, individual dimension and private sphere, (c) are multidimensional, comprised of several inter-related components, (d) vary according to teachers' educational/cultural background and personal identity, (e) are related to other environmental constructs, (f) affect teaching practices, (g) can be cultivated during teacher education, (h) can be further enhanced during professional development initiatives. These findings bear significant implications for policymakers, researchers, and teacher educators in the field of environmental and sustainability education.

The Role of Extracurricular Activities in Preparing Pre-service Teachers as Active Citizens

Keywords: Case Studies, Citizenship Education, Competencies, Pre-service Teacher Education

Presenting Author:Sibel Akin-Sabuncu, TED University, Faculty of Education, Turkey

This study aimed to investigate the role of extracurricular activities in building teacher candidates' active citizenship competence based on the perspectives of teacher educators and pre-service teachers. Employing qualitative case study design, the study was conducted within the context of the education faculty of a private university in Turkey that has several possibilities to encourage university students to attend different types of extracurricular activities. The participants included 10 teacher educators selected by maximum variation sampling and 20 pre-service teachers selected through criterion sampling. The data were collected through semi-structured and face-to-face individual interviews with the teacher educators and a total of 5 focus group interviews with the pre-service teachers. Each individual or focus group interview took nearly 35-45 minutes, which were all audio-recorded and then, transcribed verbatim. The data analysis was performed by content analysis method via NVivo 10. To establish the trustworthiness of the study, several strategies were used to ensure the credibility, transferability, dependability and confirmability of the research. Overall, the results provided empirical evidence concerning the pivotal role of the extracurricular activities in developing teacher candidates' active citizenship competence, particularly with respect to their (1) development of political literacy, (2) community involvement or participation to society, and (3) moral and social development. Thus, the present study emphasizes extracurricular activities as an alternative approach to formal education to foster prospective teachers' active citizenship competence in pre-service teacher education and provides rich implications for policy and practice regarding how to widen the scope of civic education in universities.

Teaching ESD – factors influencing student teachers' implementation intention

Keywords: Attitudes and Beliefs, Citizenship Education, Environmental Education, Pre-service Teacher Education

Presenting Author:Elisabeth Wegner, University of Freiburg, Germany; **Co-Author:**Julia Stössel, University of Freiburg, Germany; **Co-Author:**Rebecca Baumann, University of Freiburg, Germany

"Education for Sustainable Development (ESD)" aims at empowering individuals to create sustainable and just societies through education. Both national and international frameworks call for the integration of ESD in all schools. Consequently, teacher training needs to prepare teachers to implement ESD, not only by providing knowledge about ESD, but also by addressing motivational aspects influencing teachers' intention to implement ESD. Therefore, we investigated in an online survey with $N = 366$ student teachers which motivational factors (such as attitude towards ESD, subjective norm, perceived behavioral control, expectation of success, and subjective task value) and which potential background variables (such as general attitudes towards sustainability related issues, knowledge about sustainability/ESD, study subjects) influence student teachers' ESD implementation intentions. The results of multiple linear regression analyses showed a higher ESD implementation intention for student teachers with a positive ESD attitude, higher perceived behavioral control and/or higher expectation of success. ESD implementation intention was also higher when respondents attributed high intrinsic value, high subjective importance and/or low perceived cost to ESD implementation. No effects were found for subjective norm and subjective usefulness. The exploratory study of background variables showed that knowledge of the sustainability-concept influenced the ESD implementation intentions positively, but preparing to teach at least one ESD-related subject (such as geography or biology) surprisingly lowered ESD implementation intentions. These findings can be used to improve the design of ESD courses for student teachers in order to increase the probability of future ESD implementations in schools.

Session K 1

24 August 2021 18:45 - 19:45

Session Room 8

ICT Demonstration

Learning and Instructional Technology

ACTrain@School: Can we bring AI to the classroom to foster self-regulated learning?

Keywords: Artificial Intelligence, Computer-assisted Learning, Educational Technology, Self-regulation

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Learning requires a multitude of metacognitive activities that support knowledge acquisition and direct the learning process. These include selecting and planning goals, applying, observing and evaluating learning strategies as well as regulatory efforts required for goal achievement. We introduce an example of how learners can be supported to set goals, implement periods of focused work and integrate a meaningful break management by using the AI-based training software ACTrain. Metacognitive feedback based on principles of machine learning conveys the value of staying focused on goal-related activities. Pilot results already indicate positive effects of the presented approach and suggest further investigation. We will explore potentials for integrating such approach in school settings and how this could affect the role of teachers.

ACTrain@School: Can we bring AI to the classroom to foster self-regulated learning?

Presenting Author:Maria Wirzberger, University of Stuttgart, Germany

Learning requires a multitude of metacognitive activities that support knowledge acquisition and direct the learning process. These include selecting and planning goals, applying, observing and evaluating learning strategies as well as regulatory efforts required for goal achievement. We introduce an example of how learners can be supported to set goals, implement periods of focused work and integrate a meaningful break management by using the AI-based training software ACTrain. Metacognitive feedback based on principles of machine learning conveys the value of staying focused on goal-related activities. Pilot results already indicate positive effects of the presented approach and suggest further investigation. We will explore potentials for integrating such approach in school settings and how this could affect the role of teachers.

Session K 2

24 August 2021 18:45 - 19:45

Session Room 17

ICT Demonstration

Learning and Instructional Technology

Labour Market Driven Education using Open and Free Educational Resources

Keywords: Artificial Intelligence, E-Learning/Online Learning, Learning Technologies, Lifelong Learning

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

This work departs from the recent, turbulent changes in global societies, forcing many citizens to re-skill themselves in order to (re)gain employment. Learners

thus affected need to be equipped with skills to be autonomous and strategic about their own skill development. The authors depart from the premise that, high-quality, online, personalized educational content - Open Educational Resources (OER) - and services, such as personalized content recommendations or OER search, are essential to serve the concomitant high demand for learning content. However, OER applicability has been limited, due to questionable metadata quality, poor dissemination and matching to demand, and complex quality control processes. Therefore, the authors detail a novel, personalised, open, and free educational recommendation method delivering a path to learners' skill targets. This is done by: 1) using a quality prediction model for educational resources based on metadata, properties, and content; 2) supporting learners to set individual skill targets based on actual labour market information, 3) researching and developing a personalized open and free educational resource recommender to help learners to master their skill targets, and 4) providing assessment services that monitor individual learning processes as the learner acquire targeted skills.

Labour Market Driven Education using Open and Free Educational Resources

Presenting Author:Mohammadreza Tavakoli, German National Library for Science and Technology (TIB), Germany; **Presenting Author:**Gábor Kismihók, Leibniz Information Centre for Science and Technology, Germany; **Co-Author:**Stefan Mol, University of Amsterdam, Netherlands; **Co-Author:**Alan Berg, University of Amsterdam, Netherlands; **Co-Author:**Jarno Vrolijk, University of Amsterdam, Netherlands

This work departs from the recent, turbulent changes in global societies, forcing many citizens to re-skill themselves in order to (re)gain employment. Learners thus affected need to be equipped with skills to be autonomous and strategic about their own skill development. The authors depart from the premise that, high-quality, online, personalized educational content - Open Educational Resources (OER) - and services, such as personalized content recommendations or OER search, are essential to serve the concomitant high demand for learning content. However, OER applicability has been limited, due to questionable metadata quality, poor dissemination and matching to demand, and complex quality control processes. Therefore, the authors detail a novel, personalised, open, and free educational recommendation method delivering a path to learners' skill targets. This is done by: 1) using a quality prediction model for educational resources based on metadata, properties, and content; 2) supporting learners to set individual skill targets based on actual labour market information, 3) researching and developing a personalized open and free educational resource recommender to help learners to master their skill targets, and 4) providing assessment services that monitor individual learning processes as the learner acquire targeted skills.

Session K 3

24 August 2021 18:45 - 19:45

Session Room 10
ICT Demonstration
Instructional Design

Sharing templates for lesson plans in the educational microblogging tool Talkwall

Keywords: Design-based Research, Educational Technology, Instructional Design, Teacher Professional Development
Interest group: SIG 06 - Instructional Design

This ICT demonstration will present the template functionality of the microblogging tool Talkwall with a concrete example from one teacher's lesson. We will also report on our collaboration with teachers and their experiences of using Talkwall in lessons. Designed for educational contexts, Talkwall is a browser-based microblogging platform that encourages student participation and the sharing of ideas. We drew the empirical material from a teacher-researcher collaboration in the period 2016–2020 that was part of the [anonymised] research project. The template functionality is the most recent redesign resulting from our teacher-researcher collaboration. We believe that the teachers' desire for this feature reflects their growing awareness of the importance of design, the development of learning environments and the usefulness of sharing directly with other teachers at and beyond the local school level, but more research is needed to analyse whether and how teachers use such resources to improve classroom learning environments.

Sharing templates for lesson plans in the educational microblogging tool Talkwall

Presenting Author:Ingvill Rasmussen, University of Oslo, Norway; **Presenting Author:**Ole Smørdal, Department of Education, Norway; **Co-Author:**Victoria Cook, University of Cambridge, UK, United Kingdom; **Co-Author:**Paul Warwick, University of Cambridge, United Kingdom; **Co-Author:**Kari Anne Rødnes, University of Oslo, Norway

This ICT demonstration will present the template functionality of the microblogging tool Talkwall with a concrete example from one teacher's lesson. We will also report on our collaboration with teachers and their experiences of using Talkwall in lessons. Designed for educational contexts, Talkwall is a browser-based microblogging platform that encourages student participation and the sharing of ideas. We drew the empirical material from a teacher-researcher collaboration in the period 2016–2020 that was part of the [anonymised] research project. The template functionality is the most recent redesign resulting from our teacher-researcher collaboration. We believe that the teachers' desire for this feature reflects their growing awareness of the importance of design, the development of learning environments and the usefulness of sharing directly with other teachers at and beyond the local school level, but more research is needed to analyse whether and how teachers use such resources to improve classroom learning environments.

Session K 4

24 August 2021 18:45 - 19:45

Session Room 12
ICT Demonstration

How to address students' cognitive and motivational heterogeneity in online learning environments

Keywords: E-Learning/Online Learning, Higher Education, Pre-service Teacher Education, Synergies between Learning; Teaching and Research
Interest group:

University courses often employ "one-size-fits-all" approaches, disregarding the heterogeneity in students' cognitive and motivational characteristics. This demonstration introduces an instructional method for online teaching in higher education called *digital differentiation grid*. This didactic concept provides differentiated instruction through learning tasks on varying levels of complexity. It is implemented as open source software within the Moodle learning management system. The demonstration shows how to design a differentiation grid and how to use the method within a blended or online learning course. Pivotal is the construction of learning tasks. These are oriented towards competence assessment, where students can repeat, apply, and reflect upon their previously acquired knowledge. The method structures a given topic, because the position of a field in the grid explicitly reveals the complexity level (i.e. the task requirements) of a selected task set to the student. The method can be used for formative self-assessment by offering computerized feedback. In a randomized field study with N = 438 university students, we investigated the effects of digital differentiation grids on students' motivation (self-concept, self-efficacy, intrinsic and utility task values), on their performance, and, because our sample consisted of teacher students, on their professional development with regard to inclusive education. Employing structural equation modeling, we found that the intervention positively affected the self-concepts of effort avoidant students. The intervention also positively impacted students' attitudes and self-efficacy towards inclusive education, but had no effect on course performance, course-related self-efficacy and task values. Moreover, learning analytics data revealed in-depth information on students' learning behavior.

How to address students' cognitive and motivational heterogeneity in online learning environments

Presenting Author:Julia Dietrich, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Franziska Greiner, Friedrich Schiller University of Jena, Germany; **Co-Author:**Dorit Weber-Liel, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Belinda Berweger, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Nicole Kämpfe, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Baerbel Kracke, University of Jena, Germany

University courses often employ "one-size-fits-all" approaches, disregarding the heterogeneity in students' cognitive and motivational characteristics. This demonstration introduces an instructional method for online teaching in higher education called *digital differentiation grid*. This didactic concept provides

differentiated instruction through learning tasks on varying levels of complexity. It is implemented as open source software within the Moodle learning management system. The demonstration shows how to design a differentiation grid and how to use the method within a blended or online learning course. Pivotal is the construction of learning tasks. These are oriented towards competence assessment, where students can repeat, apply, and reflect upon their previously acquired knowledge. The method structures a given topic, because the position of a field in the grid explicitly reveals the complexity level (i.e. the task requirements) of a selected task set to the student. The method can be used for formative self-assessment by offering computerized feedback. In a randomized field study with N = 438 university students, we investigated the effects of digital differentiation grids on students' motivation (self-concept, self-efficacy, intrinsic and utility task values), on their performance, and, because our sample consisted of teacher students, on their professional development with regard to inclusive education. Employing structural equation modeling, we found that the intervention positively affected the self-concepts of effort avoidant students. The intervention also positively impacted students' attitudes and self-efficacy towards inclusive education, but had no effect on course performance, course-related self-efficacy and task values. Moreover, learning analytics data revealed in-depth information on students' learning behavior.

Session K 5

24 August 2021 18:45 - 19:45

Session Room 13

ICT Demonstration

Assessment and Evaluation

Live Remote Proctoring with Safe Exam Browser for Written, Oral or Collaborative Online Examinations

Keywords: Assessment Methods and Tools, Computer-supported Collaborative Learning, Educational Technology, Technology

Interest group: SIG 01 - Assessment and Evaluation

Safe Exam Browser (SEB) is an open source, freeware application for Windows, macOS, and iOS. It temporarily turns any computer into a secure workstation by controlling access to resources like system functions, websites, or applications, thus preventing students from accessing unauthorized resources during an examination. A diverse range of educational institutions around the world use SEB for their examinations in combination with various web-based e-assessment solutions. In this interactive ICT demonstration, we present and discuss new remote proctoring features built into SEB. The features replicate the situation in an examination hall, where proctors walk around and invigilate students taking a test. Candidates are monitored during an examination using the webcam and microphone in their devices. The new features also enable interaction via live video/audio stream or a built-in chat. Examiners can for example give students last-minute instructions before an examination starts, or they can support individual students in case of questions or problems. Alternatively, the communication functionality may be used for remote online oral examinations, or for innovative scenarios such as computer-supported collaborative (computer-based) examinations. Optional Artificial Intelligence proctoring features track face movements and the number of faces visible in the camera stream. Face detection and tracking is performed on-device. Detected events are logged and displayed with a symbol in the video stream. The new remote proctoring features are implemented by integrating the open source video conferencing solution Jitsi Meet into SEB. The solution does not use any centralized cloud services providing full control of privacy.

Live Remote Proctoring with Safe Exam Browser for Written, Oral or Collaborative Online Examinations

Presenting Author: Tobias Halbherr, ETH Zurich, Switzerland; **Co-Author:** Daniel Schneider, ETH Zurich, Switzerland; **Co-Author:** Bruno Rütsche, ETH Zurich, Switzerland; **Co-Author:** Thomas Piendl, ETH Zurich, Switzerland

Safe Exam Browser (SEB) is an open source, freeware application for Windows, macOS, and iOS. It temporarily turns any computer into a secure workstation by controlling access to resources like system functions, websites, or applications, thus preventing students from accessing unauthorized resources during an examination. A diverse range of educational institutions around the world use SEB for their examinations in combination with various web-based e-assessment solutions. In this interactive ICT demonstration, we present and discuss new remote proctoring features built into SEB. The features replicate the situation in an examination hall, where proctors walk around and invigilate students taking a test. Candidates are monitored during an examination using the webcam and microphone in their devices. The new features also enable interaction via live video/audio stream or a built-in chat. Examiners can for example give students last-minute instructions before an examination starts, or they can support individual students in case of questions or problems. Alternatively, the communication functionality may be used for remote online oral examinations, or for innovative scenarios such as computer-supported collaborative (computer-based) examinations. Optional Artificial Intelligence proctoring features track face movements and the number of faces visible in the camera stream. Face detection and tracking is performed on-device. Detected events are logged and displayed with a symbol in the video stream. The new remote proctoring features are implemented by integrating the open source video conferencing solution Jitsi Meet into SEB. The solution does not use any centralized cloud services providing full control of privacy.

Session K 6

24 August 2021 18:45 - 19:45

Session Room 14

Panel Discussion

Learning and Special Education

Opportunities of equal education access by considering the relation between language and math skills

Keywords: At-risk Students, Language (L1/Standard Language), Learning and Developmental Difficulties, Mathematics

Interest group: SIG 15 - Special Educational Needs

Chairperson: Nurit Viesel-Nordmeyer, Technische Universität Dortmund, Germany

Since language and mathematical skills are key competencies that enable successful access to educational processes and participation in social life, special attention should be paid to an adequate development of both skills. In particular, the seemingly strong relation between language and mathematical learning, which becomes distinctly relevant when learning difficulties occur, should be taken into account. Thus, the aim of our panel discussion is to debate several concerns raised by interdisciplinary researchers and practical stakeholders' experience. Thereby, a deeper understanding of "what else is necessary to know about" and "how can we support" in the context of equal opportunities for language and mathematical skills should be reached. Firstly, the challenge of an early support of mathematical skills whose delays seems to be more difficult to compensate for than language delays – even in children with primary language deficits – will be addressed. Secondly, a better understanding of the causes for the risk of comorbid language and mathematical learning deficits will be supported, followed by a consideration of opportunities for pre- and intervention. Thirdly, building on the possible causes of comorbidity, consideration of working memory resources for classroom practice and intervention will be emphasized. Fourthly, the opportunity of working memory training as an additional resource for language and mathematical support will be considered. In conclusion, regarding the current challenges for learning and instruction, the opportunities to provide equal access to language and mathematical learning using physical contactless diagnostic, training and research tools will be debated.

Opportunities of equal education access by considering the relation between language and math skills

Presenting Author: Tanya Evans, University of Virginia, United States; **Presenting Author:** Deanna Keyes, Not applicable, United States; **Presenting Author:** Joerg-Tobias Kuhn, TU Dortmund University, Germany; **Presenting Author:** Jérôme Prado, Centre National de la Recherche Scientifique (CNRS), France; **Presenting Author:** Noelia Sánchez-Pérez, University of Zaragoza, Spain; **Presenting Author:** Kirsten Winkel, University of Mainz, Germany

Since language and mathematical skills are key competencies that enable successful access to educational processes and participation in social life, special attention should be paid to an adequate development of both skills. In particular, the seemingly strong relation between language and mathematical learning,

which becomes distinctly relevant when learning difficulties occur, should be taken into account. Thus, the aim of our panel discussion is to debate several concerns raised by interdisciplinary researchers and practical stakeholders' experience. Thereby, a deeper understanding of "what else is necessary to know about" and "how can we support" in the context of equal opportunities for language and mathematical skills should be reached. Firstly, the challenge of an early support of mathematical skills whose delays seems to be more difficult to compensate for than language delays – even in children with primary language deficits – will be addressed. Secondly, a better understanding of the causes for the risk of comorbid language and mathematical learning deficits will be supported, followed by a consideration of opportunities for pre- and intervention. Thirdly, building on the possible causes of comorbidity, consideration of working memory resources for classroom practice and intervention will be emphasized. Fourthly, the opportunity of working memory training as an additional resource for language and mathematical support will be considered. In conclusion, regarding the current challenges for learning and instruction, the opportunities to provide equal access to language and mathematical learning using physical contactless diagnostic, training and research tools will be debated.

Session K 7

24 August 2021 18:45 - 19:45

Session Room 7

Panel Discussion

Teaching and Teacher Education

Developing and Nurturing Political Efficacy among Youth

Keywords: Citizenship Education, In-service Teacher Education, Self-efficacy, Synergies between Learning; Teaching and Research

Interest group: SIG 13 - Moral and Democratic Education

Chairperson: Lihong Huang, Norway

This panel discussion presents some preliminary results from an ongoing research project on democratic citizenship education in Norway titled *Democracy, Equality, Learning and Mobilisation for Future Citizens* (DEMOCIT 2020-2023 <https://www.oslomet.no/en/research/research-projects/democit>). DEMOCIT project aims to find research evidence to answer the question: how do Norwegian youths develop political efficacy and belief in their own participation in democratic society? In this panel presentation, we focus on the concept of political efficacy from perspectives of school students, teachers, young people's daily lives, Nordic teacher educators, international civil organisations such as Save the Children Norway and the European Wergeland Centre and their collaborations with Norwegian schools on citizenship education.

Developing and Nurturing Political Efficacy among Youth

Presenting Author:Eva Kosberg, OsloMet, Norway; **Presenting Author:**Tessa Eriksen Greve, Oslo metropolitan university, Norway; **Presenting Author:**Lars Birger Davan, OsloMet, Norway; **Presenting Author:**Grete Vandvik, Save the Children Norway, Norway; **Presenting Author:**Ingrid Aspelund, The European Wergeland Center, Norway; **Co-Author:**Anders Kjøstvedt, Oslo Metropolitan University, Norway

This panel discussion presents some preliminary results from an ongoing research project on democratic citizenship education in Norway titled *Democracy, Equality, Learning and Mobilisation for Future Citizens* (DEMOCIT 2020-2023 <https://www.oslomet.no/en/research/research-projects/democit>). DEMOCIT project aims to find research evidence to answer the question: how do Norwegian youths develop political efficacy and belief in their own participation in democratic society? In this panel presentation, we focus on the concept of political efficacy from perspectives of school students, teachers, young people's daily lives, Nordic teacher educators, international civil organisations such as Save the Children Norway and the European Wergeland Centre and their collaborations with Norwegian schools on citizenship education.

Session K 8

24 August 2021 18:45 - 19:45

Session Room 1

Panel Discussion

New Horizons for Citizenship Education

Keywords: Argumentation, Citizenship Education, Computer-supported Collaborative Learning, Social Aspects of Learning and Teaching

Interest group:

Chairperson: Baruch Schwarz, Hebrew University of Jerusalem, Israel

In recent decades, many national educational systems have added citizenship education as a distinct school subject or as a learning goal within different subject across the curriculum (Schulz et al., 2017). In this panel proposal we outline three major obstacles for practice of and research into citizenship education: 1) epistemological- developing citizens as knowers, 2) dialogic- developing citizens as interlocutors, and 3) the meaning of new technology for political learning and 'subjectification' (Biesta, 2020). The panelists will present and analyze findings closely related to these analytic themes from their research of science education (Solli & Makitalo), environmental activism (Varpanen), global citizenship education (Surian) and public deliberation (Gideon, Keynan, Prague and Slakmon). By bringing diverse practices and theoretical perspectives, the panel will allow a meaningful discussion about the future of citizenship education.

New Horizons for Citizenship Education

Presenting Author:Ido Gideon, The Hebrew University of Jerusalem, Israel; **Presenting Author:**Omer Keynan, The Hebrew University of Jerusalem, Israel;

Presenting Author:Benzi Slakmon, Tel Aviv University, Israel; **Presenting Author:**Alessio Surian, Università degli Studi di Padova, Italy; **Presenting Author:**Jan Varpanen, University of Tampere, Finland, Finland; **Presenting Author:**Anne Solli, University of Gothenburg, Sweden; **Presenting Author:**Asa Makitalo, University of Gothenburg, Sweden

In recent decades, many national educational systems have added citizenship education as a distinct school subject or as a learning goal within different subject across the curriculum (Schulz et al., 2017). In this panel proposal we outline three major obstacles for practice of and research into citizenship education: 1) epistemological- developing citizens as knowers, 2) dialogic- developing citizens as interlocutors, and 3) the meaning of new technology for political learning and 'subjectification' (Biesta, 2020). The panelists will present and analyze findings closely related to these analytic themes from their research of science education (Solli & Makitalo), environmental activism (Varpanen), global citizenship education (Surian) and public deliberation (Gideon, Keynan, Prague and Slakmon). By bringing diverse practices and theoretical perspectives, the panel will allow a meaningful discussion about the future of citizenship education.

Session K 9

24 August 2021 18:45 - 19:45

Session Room 11

Poster Presentation

Culture, Morality, Religion and Education, Lifelong Learning

Citizenship Education

Keywords: Arts, Case Studies, Citizenship Education, Content Analysis, Cultural Diversity in School, Environmental Education, Lifelong Learning, Mixed-method Research, Morality, Out-of-School Learning, Phenomenography, Qualitative Methods, Reasoning, Secondary Data Analysis, Social Aspects of Learning and Teaching, Survey Research

Interest group: SIG 13 - Moral and Democratic Education, SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Saswati Chaudhuri, University of Jyväskylä, Finland

Innovative forms of Bildung as an approach for democratic involvement and practice

Keywords: Case Studies, Citizenship Education, Lifelong Learning, Qualitative Methods

Presenting Author: Stefanie A. Hillen, Department of Education, Norway; **Co-Author:** Rainer Christ, Head of Division (ret.) at Ministry for Science, Culture & Further Education, Rhineland-Palatinate, Germany

Innovative forms of Bildung as an approach for democratic involvement and practice: Experiences made within the German adult democratic education – a qualitative study by experts' interviews and document analysis. The study focuses on the experiences with "Innovative forms of Bildung" an initiative for supporting democratic participation by "political education" of citizens. In many western democratic societies, much energy is taken into democratic education, but the traditional offered educational initiatives, programs, courses etc., in adult education seem to reach mainly those already interested and educated. With the "Innovative forms of Bildung" a pilot program initiated by the Land Rhineland-Palatinate (regional ministry), seeks to encourage and involve the citizens to critical, constructive, democratic action, specifically addressing adults e. g. by including other cultural agents or institutions e.g. theatre events, art performance as well as testing new forms and mediation of courses for instance internet-based offers. To show first results, experts, that is, leaders and decision-makers in adult and further education involved in this strategic, political innovative education project are used as respondents (n)

Moral Education Curriculum in Italian middle school: a research design

Keywords: Citizenship Education, Content Analysis, Mixed-method Research, Morality

Presenting Author: Liliana Silva, University of Messina, Italy; **Co-Author:** Maurizio Fabbri, Alma Mater Studiorum University of Bologna, Italy; **Co-Author:** Ira Vannini, Alma Mater Studiorum Università di Bologna, Italy

The poster will present the design of research conducted in the context of the moral education curriculum in middle school. Starting from the theoretical framework, the research objective is to define research questions about the characteristics of moral education practices in the Italian context, about implicit beliefs of teachers with respect to moral education in school curricula. Effects of health emergency COVID-19 on research is also investigated not only from a content point of view not only from the point of view of the contents (as moral education with reference to pandemic) but also from a methodological point of view (how can we conduct a case study with distances?). The research includes a documentary analysis of 100 Three-year Educational Offer Plans (in Italian, PTOFs), 10 case studies, and a national questionnaire in 400 schools. From the first analyses carried out on the 100 PTOFs, it is possible to highlight the scarce presence of practices compared to the declared objectives. Deontology (with particular reference to teacher training) and morality emerge as macro-categories. Needs for planning and collegiality, assessment tools, educational co-responsibility, and computational thinking also emerge.

Moral education as a tool for democratic societies: a documentary analysis in Italian middle schools

Keywords: Citizenship Education, Content Analysis, Morality, Reasoning

Presenting Author: Liliana Silva, University of Messina, Italy; **Co-Author:** Elia Pasolini, Alma Mater Studiorum Università di Bologna, Italy; **Co-Author:** Maurizio Fabbri, Alma Mater Studiorum Università di Bologna, Italy

The research aims to investigate the practices of moral education in the contexts of Italian lower secondary schools, through the investigation of what is declared by the schools in the Three-year Educational Offer Plans (in Italian, PTOFs). The documentary analysis was carried out on 100 PTOFs, according to a coding grid validated through a work shared between two researchers. The grid is structured on the subdivision into macro-categories, which are in turn divided into objectives and practices, and highlighted some interesting results about two elements related to citizenship education: participation and citizenship education. Concerning the "Participation" macro-category, we can see how the codes relating to the "Participation" are mainly located in the geographic macro-area of the North-East, followed by the North-West; they converge towards medium-large institutions, located in medium-sized contexts. Civic education and participation itself, with reference to practices such as the creation of the "municipal council for children" and the importance attributed to "memory". Placing our attention on the results obtained from the analysis of citizenship education practices, (N = 1330 references), we can also observe their distribution among the "Participation" macro-category (53% references); "Morality" (45%), and "Deontology" (1.1%). It will be highlighted how learning and education play an increasingly important role in promoting values, but also the skills and knowledge necessary to acquire them in an authentic way, in the face of the social and cultural reality that surrounds us, or of the current pandemic context.

Understanding biodiversity's conceptions based on student's analogies

Keywords: Citizenship Education, Environmental Education, Phenomenography, Survey Research

Presenting Author: Laura Leon, University of Geneva, Switzerland; **Co-Author:** Catherine Audrin, University of Geneva, Switzerland; **Co-Author:** Emmanuel Sander, University of Geneva, Switzerland

Nowadays, the notion of biodiversity is fully integrated in curricula of several countries. However, it remains a complex concept that encompasses scientific and political aspects. Two approaches can be especially considered: conservationism that allows humanity to exploit sparingly nature and preservationism that encourages humanity to limit his impact (Barroca-Paccard et al., 2018). The aim of the current study is to identify to which extent these approaches are present in the conceptions of biodiversity. Considering that analogies shape conceptions (Hofstadter & Sander, 2013), the study of analogies regarding biodiversity should enable us to understand the conceptions of biodiversity among our current population: 256 participants were asked to describe biodiversity on the basis of analogies and an exploratory lexicography analysis bearing on the proposed descriptions was conducted. A hierarchical classification was followed by a factorial correspondence analysis and a similarity analysis on the clusters identified. Results highlight three major groups of metaphors: the first one refers to a scientific aspect, the idea that a large number of species exists, the second one to conservationism and the last one to preservationism. Theoretical and educational implications are discussed.

Cultural Education: A panacea for civic and political engagement in rural areas?

Keywords: Arts, Citizenship Education, Out-of-School Learning, Secondary Data Analysis

Presenting Author: Lea Fobel, University of Leipzig, Germany; **Co-Author:** Martin Büdel, University of Leipzig, Germany; **Co-Author:** Nina Kolleck, University of Leipzig, Germany

In recent years, cultural education and arts education have been repeatedly highlighted as key areas in discussions about promoting active citizenship and the democratisation of participation structures (Hauge, 2014; Jessop, 2016; Sievers, 2018). While there are some empirical findings on the topic (Kemperl, 2013), many aspects of cultural education still remain unconsidered or undifferentiated. The paper seeks to contribute to addressing the research gap by reviewing literature and empirical findings on the relations between cultural education/arts education and active citizenship. We focus on issues of unequal access and participation, particularly with respect to regional disparities (Kraehe, Acuff, & Travis, 2016). Aligning findings from the review and the analysis of quantitative secondary data, we examine the relationships between cultural education and civic as well as political engagement. Our results show that access to educational programmes is limited by factors such as socioeconomic strata and residential location. The advantages that cultural or arts education might provide seem more accessible to certain social groups. However, our analyses so far do not indicate any significant difference between rural and urban regions in the effect of non-formal cultural and arts education on political interest.

Perception of and coping with multiple institutional discrimination by young women at school

Keywords: Citizenship Education, Cultural Diversity in School, Qualitative Methods, Social Aspects of Learning and Teaching

Presenting Author: Eva Dalhaus, University of Education, Freiburg, Germany

Current educational guidelines on inclusion require teachers in schools to provide the best possible individual support for students. However, it seems problematic that in the international and national research discourse there are clear indications of institutional discrimination or structural violence (Gomolla & Radtke, 2009) against pupils from migrant families. It can be assumed, that young women from migrant families are particularly affected, because they are exposed to intersectionality due to their social, ethnic and gender characteristics. The presentation likes to give incentives for reflection on unconsciously and consciously exercised practices of discriminatory teacher action. For this purpose, a planned project is presented. With reference to habitus and habitus

transformation following Bourdieu (1998) and with the help of narrative interviews the project aims to explore the perception of and coping with multiple institutional discrimination at school by female teacher training students from migrant families. The collected data will be analyzed on the basis of a constructivist grounded theory (Charmaz, 2014). In a first step, findings on linked practices of classist, ethnic and gender institutional discrimination, which amount to "changed evaluation standards", "low attention and refused recognition", and "assumptions of inferiority" will be analyzed. In a second step, different forms of perception of and coping with discrimination are presented. Experiences of institutional discrimination can be processed by those affected in a negative sense "defensively" (accepting them as unchangeable) or in a positive sense "pragmatically" (coping individually) and "offensively" (actively criticizing and overcoming).

Session K 10

24 August 2021 18:45 - 19:45

Session Room 5

Poster Presentation

Educational Policy and Systems, Higher Education, Teaching and Teacher Education

Teacher Professional Development

Keywords: Attitudes and Beliefs, Case Studies, Higher Education, In-service Teacher Education, Instructional Design, Professions and Applied Sciences, Qualitative Methods, School Effectiveness, Secondary Education, Teacher Professional Development, Vocational Education

Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education

Chairperson: Francisco Peixoto, Portugal

Shaping the future - teachers engagement with Education for Sustainable Development in Norway

Keywords: Case Studies, In-service Teacher Education, Qualitative Methods, Teacher Professional Development

Presenting Author:Sonia Felix, NTNU (Norwegian University of Science and Technology), Norway

The intent is to explore the possible modus operandi related with Critical Thinking (CT) dispositions and Education for Sustainable Education (ESD). In this interplay, Teachers Professional Development (TPD) has been located in ESD practice within the discourse that happens in local institutions as increasingly important (UNESCO, 2018). As a theoretical construct, CT can be perceived as skills and dispositions (Lai, 2011) exercised within changing situations that one can find oneself. Methodologically I pursued a qualitative approach, while interviewing teachers from one public primary school in Norway. Through Positioning Theory (Harré & Langenhove, 1999), an intersection of social and discursive psychology as analytical lens i will provide a social professional context to make sense about teachers positioning in relation to the ESD concept. CT is defined through skills and dispositions (Lai, 2011), but here I will just focus on dispositions (Ennis, 2015) as a possible theoretical construct. ESD as a concept I will relate with a pluralistic and acknowledges with different perspectives, views and values (Borg et al., 2012) interrelated with PT core concepts.

The Role Enactment of Academic Developers Supporting Teacher reDesign Teams in a University Setting

Keywords: Higher Education, Instructional Design, Qualitative Methods, Teacher Professional Development

Presenting Author:Loulou Detienne, UGENT, Belgium; **Co-Author:**Tijs Rotsaert, Ghent University, Belgium; **Co-Author:**Tammy Schellens, Ghent University, Belgium

As student-centered approaches receive more and more attention in higher education, our focus should shift on how to support and implement such innovative learning approaches. One potential strategy for this is the use of Teacher redesign Teams (TrDT), in which the support of an academic developer is imperative for its effectiveness. Previous studies mention diversified findings on role categorization and role-uptake by facilitators. This study attempts to bring these findings together and provide a better understanding of the varying role of a TrDT facilitator in a university setting. During two focus groups, data was collected from ten facilitators who had been supporting TrDTs for about one year. A thematic analysis revealed that existing models on the role of the TrDT facilitator have limitations, certainly when applied in university settings. That is why we propose a new extended framework specifically altered to the TrDT-roles of an academic developer in a university setting.

Teachers for the futures? Neglected sociomaterial dimension of teacher professionalism

Keywords: Attitudes and Beliefs, Professions and Applied Sciences, Qualitative Methods, Teacher Professional Development

Presenting Author:Ka Lok Cheng, The University of Hong Kong, Hong Kong; **Co-Author:**Carol Chan, The University of Hong Kong, Hong Kong; **Co-Author:**Sai Mun Stanley Ho, The Univeristy of Hong Kong, Hong Kong; **Co-Author:**Wing Hoi Cathy Shiu, The University of Hong Kong, Hong Kong

The current study surveys the current understandings of teaching professionalism in Hong Kong and considers the ways how the definition could be re-written to allow better reflection of the professional realities of teachers particularly in the post-COVID world, which is expected to be much characterized by technology-mediated learning and teaching. Fifteen teachers and members from other sectors were interviewed and their responses were analyzed with a particular focus on the sociomaterial aspects of the teaching profession. As expected, the official teacher registration procedures, abstract educational aims and structured professional learning opportunities were indicated as what qualify and characterize teaching as a profession. The sociomaterial attention excluded from informants' responses suggests the need to highlight the embedded nature of teachers' work in a renewed definition of teacher professionalism through foregrounding the previously black-boxed processes, and the needed thoughtfulness on the material aspects of everyday educational processes that go beyond classroom. This paper should help to re-open the dialogue on the meaning of teacher professionalism and to indicate the need to re-develop the teacher education programmes for cultivating critical users of emergent and pervasive educational technologies.

Fostering distributed leadership at schools: A case study in the Asian context

Keywords: Case Studies, Qualitative Methods, School Effectiveness, Teacher Professional Development

Presenting Author:Jessica To, National Institute of Education, Nanyang Technological University, Hong Kong; **Co-Author:**Yuen Yi Lo, The University of Hong Kong, Hong Kong

Distributed leadership facilitates the implementation of school innovations. However, the prevalence of top-down management approach at schools may constrain the distribution of leadership activities in the Asian context. Using the second generation of Activity Theory as the theoretical lens, this case study discusses how leadership activities could be stretched at a primary school in Hong Kong. Through observations of 45 lesson co-planning meetings and nine post-lesson observation debriefing meetings and individual interviews with the Principal and three Subject Heads, we identified that changing institutional norms played a pivotal role in developing vertical leadership from the Principal to the Subject Heads. The Principal's support and confidence in the Subject Heads were important in nurturing the latter's leadership capabilities. The significance of this paper lies in outlining effective strategies for fostering distributed leadership in the Asian context.

Expertise development of university teachers in different teacher tasks: A multiple-case study

Keywords: Case Studies, Higher Education, Qualitative Methods, Teacher Professional Development

Presenting Author:Esther van Dijk, Universiteit Utrecht / Hogeschool Utrecht, Netherlands; **Co-Author:**Jan van Tartwijk, Utrecht University, Netherlands; **Co-Author:**Marieke van der Schaaf, University Medical Center Utrecht, Netherlands; **Co-Author:**Manon Kluijtmans, UMC Utrecht, Netherlands

In light of increased attention for teaching quality and professional development of university teachers, this study investigates development of teacher expertise in higher education. The study builds on a review that synthesized teacher expertise frameworks in higher education and found six teacher tasks and three task-related dimensions for expertise development (Van Dijk et al., 2020). The present study aims to investigate how university teachers develop expertise in their different tasks by addressing the following research questions: (1) 'What are patterns for expertise development of university teachers within en between different teacher tasks?' and (2) 'What facilitates expertise development of university teachers in different teacher tasks?'. By answering these questions we aim to advance our understanding of university teacher expertise development and give insight into how expertise development can be supported. In a multiple case

study design, qualitative data about expertise development of university teachers is collected by three methods: (1) two individual semi-structured interviews with university teachers with senior positions in education at Utrecht University ($n = 18$), (2) an individual semi-structured interview with one colleague and one supervisor of each teacher ($n = 36$) and (3) relevant documents about expertise development for each teacher. Data for all teachers are analyzed by iterative coding (open, selective and axial coding) and cross-case analysis using a data matrix. Initial results show that development in the different teaching tasks is intertwined and that learning by doing and learning from colleagues facilitates expertise development across all tasks.

Assessing Teacher Design Teams as a tool for the empowerment of Project Integrated General Subjects

Keywords: Qualitative Methods, Secondary Education, Teacher Professional Development, Vocational Education

Presenting Author:Tina Gryson, Ghent University, Belgium; **Co-Author:**Katrien Strubbe, Ghent University, Belgium; **Co-Author:**Tony Valcke, Ghent University, Belgium; **Co-Author:**Ruben Vanderlinde, Ghent University, Belgium

The course Project Integrated General Subjects (PGS) in Flemish vocational secondary education has the purpose to make students self-reliant and resilient in life and enhance their motivation for general subjects. Research shows that these desired results are not achieved in daily practice. The PGS teachers often lack the knowledge and skills to teach the specific didactics of the course due to the lack of a specific teaching course in PGS. This educational design research wants to address this shortcoming by exploring how Teacher Design Teams (TDTs) can be a useful tool for curriculum development in PGS. Before implementing TDTs in secondary schools, focus group interviews were organized with relevant stakeholders ($n=11$). This preliminary study made it possible to design a TDT program that considers the specific needs of the course PGS. The latter indicated that a multi-year TDT program with frequent meetings in a school-based TDT, supplemented by meetings in a networked TDT, is desirable. The school-based TDT designs teaching materials and the networked TDT offers support through knowledge exchange and feedback moments. A coach plays a prominent role in both TDTs. Autonomy and voluntary commitment of the teachers and the support and trust of the school principals are essential.

The next step in this research is the implementation of this TDT program in secondary schools. It will investigate how this program contributes to curriculum development, teaching behaviour and the learning outcomes of the students. Interim findings will be used to adjust the TDT program.

Session K 11

24 August 2021 18:45 - 19:45

Session Room 16

Poster Presentation

Higher Education, Learning and Social Interaction

Social and Peer Interaction

Keywords: Argumentation, Communities of Practice, Computer-supported Collaborative Learning, Conceptual Change, Cooperative/Collaborative Learning, Developmental Processes, Game-based Learning, Higher Education, Informal Learning, Mathematics, Mixed-method Research, Morality, Out-of-School Learning, Peer Interaction, Qualitative Methods, Reflection, Social Interaction, Student Learning

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 14 - Learning and Professional Development, SIG 21 - Learning and Teaching in Culturally Diverse Settings, SIG 25 - Educational Theory, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Anna-Lena Godhe, Malmö University, Sweden

Exploring Change in Networks Supporting the Deliberate Practice of Popular Musicians

Keywords: Cooperative/Collaborative Learning, Developmental Processes, Qualitative Methods, Social Interaction

Presenting Author:Manuel Laengler, University of Regensburg, Germany; **Co-Author:**Jasperina Brouwer, University of Groningen, Netherlands; **Co-Author:**Anneke Timmermans, University of Groningen, Netherlands; **Co-Author:**Hans Gruber, University of Regensburg, Germany

Popular musicians are embedded in dynamic networks whose actors support expertise development across different phases and address different aspects of deliberate practice. Little research exists about change of such networks over time. This study explores changes in networks supporting the deliberate practice of expert and intermediate popular musicians during their childhood, apprenticeship, and career phases. An egocentric network analysis using semi-structured interviews with five experts and five intermediates revealed that networks supporting the deliberate practice of expert musicians are more dynamic and less stable over phases, compared to those of intermediates. Experts have been supported by a larger number of network actors. In both groups, the number of network actors decreased as the musicians progressed over time, but the decrease was strongest between childhood and apprenticeship. The study showed that expertise development in popular music does not only depend on deliberate practice but also on diversity and change in adaptive support networks.

Towards Mathematics Education as part of Ethical Citizenship under Covid 19

Keywords: Mathematics, Morality, Reflection, Social Interaction

Presenting Author:Sikunder Ali, Norwegian University of Science and Technology (NTNU), Norway

Mathematics is becoming increasingly influential in formatting social systems in modern societies. When mathematics is applied to social systems, it not only describes them but can also regulate them. This paper explores the ethical consequences of applying mathematics to social systems specially as a reflective response to Covid 19 situation that we are experiencing now. This brings implications for how citizens within a democratic polity can respond to mathematically formatted structures such as reasoning based on mathematical models enlisted within social systems. For example, Covid-19 has brought out concern how to save ourselves as humans under attack by Covid 19 virus. The Reproductive number R (as a mathematical construct), embedded within social, political and economic context, is being used as a mechanism to contain spread of virus as well as regulate social fabric of the society. Here mathematics education for inclusive and ethical citizenship is offered to cope with consequences of prescriptions of mathematical formed systems in our modern globalized societies.

Peer mentoring and learning in eSports: An apprentice's learning in online in-game interactions

Keywords: Computer-supported Collaborative Learning, Game-based Learning, Peer Interaction, Social Interaction

Presenting Author:Fredrik Rusk, Nord University, Norway; **Co-Author:**Matilda Ståhl, Åbo Akademi University in Vaasa, Finland; **Co-Author:**Kenneth Silseth, University of Oslo, Norway

Becoming a competent player of online games involves complex processes and networks of online and offline life where the player is socialized into social norms and expectations. An important aspect of what constitutes gamers' learning trajectories is guidance from experienced players. However, there is little educational research on these processes within a competitive gaming scene. In this chapter, we analyse the mentor-apprentice relationship between an expert and a novice in the multiplayer first-person shooter (FPS) Counter-Strike: Global Offensive (CS:GO) within an esports and educational context. By assuming a dialogic approach to meaning-making, agency and learning, we analyse the apprentice's (Lux) trajectory towards increasing agency and how peer teaching and learning manifests in the mentor-apprentice relationship between Lux and the other players in the team. There is a trajectory towards increased agency regarding support, responsibility and expectations. The other players' orientation towards the apprentice's decisions indicates that support diminishes, and responsibility and expectations grow towards the end of the data collection. The apprentice also learns a skill that was, by the team, laughed at and turns it into his skill in the team. The other players use variations of dialogic strategies to mentor the apprentice who reconfigures his participation. Communication and collaboration appear to be an inherent part of functioning as a team and teaching others in the team, and all players are expected to reach a level of independence and enact agency, since there are situations where the player is without direct support of the team.

Cooperation in Designated Workplace Learning Settings: A Social Network Study Among Student Nurses

Keywords: Cooperative/Collaborative Learning, Informal Learning, Mixed-method Research, Peer Interaction

Presenting Author:Bianca Steffen, University of Paderborn, Germany; **Co-Author:**Michael Goller, Friedrich Schiller University Jena, Germany

Interaction and cooperation are important means for professional development because they allow novices to seek information and feedback. Unfortunately, within the German apprenticeship system future nurses have only limited chances to make use of the learning potentials of such social practices because of

understaffing and ongoing time pressure. Due to these structural problems, many nursing schools introduced student-run hospital wards (SHWs) as designated learning arrangements that are argued to give rise to an increased need and potential for interaction and cooperation among the students. However, only little is known about whether SHWs match this theoretical assumption or how interaction and cooperation at SHWs are related to professional learning and development. This study attempts to fill this gap by using a mixed-methods social network analysis approach in answering (1) How and why do nursing students interact and cooperate with each other and other medical actors (e.g., physiotherapists, physicians)? and (2) How does their interaction and cooperation support their learning process – also in the face of disputes and conflicts? Ego-centric networks, qualitative interviews, and quantitative questionnaires were used to collect rich data on how the students interacted. Preliminary analyses show that students were seeking more often for information than feedback; ask other students for help based on their assumed expertise level; seek practical information more often from qualified nurses that usually work at the ward but attempt to get knowledge concerning scholastically practices from instructors. Besides answering the research question this contribution also aims to discuss the methodological challenges within this project.

Argumentation and knowledge construction in higher education: A Vygotskian perspective

Keywords: Argumentation, Conceptual Change, Higher Education, Student Learning

Presenting Author:Ingrid González, Universidad Alberto Hurtado, Chile; **Co-Author:**Antonia Larrain, Universidad Alberto Hurtado, Chile

The argumentation, as a dialogic practice, promotes knowledge construction (Bulgren et al., 2014) and plays a key role in conceptual development (Aydeniz & Dogan, 2016). However, argumentation, as a practice for teaching and learning specialized knowledge, has a limited presence in university education. I contend that, in universities, we neither theorize about nor value argumentation as a key aspect of thought development and knowledge construction. This occurs because it is still unclear how and why the discourse of argumentation promotes knowledge construction (Larraín et al., 2014). In this presentation I propose that we should view argumentation, from Vygotsky's perspective, as a process of generalization that is demanded by the environment. This process, owing to the use and form of argumentative language, involves the construction of modes of generalization that entail relationships of contradiction, with the latter influencing conceptual development. This because concepts are open to refutation, and are contradictory in themselves. Acknowledging the potential for scientific knowledge construction of argumentative discourse can help us to visualize the true ethical issue: taking into account –or disregarding– argumentation has an unequal impact not only on students' academic progression, but also on their learning process, conceptual development, and thought.

Systemic and individual differences in adolescents' interest ecologies.

Keywords: Communities of Practice, Informal Learning, Out-of-School Learning, Social Interaction

Presenting Author:Joris Beek, University Utrecht, Netherlands; **Co-Author:**Sanne Akkerman, Utrecht University, Netherlands; **Co-Author:**Larike Bronkhorst, Utrecht University, Netherlands; **Co-Author:**Thea van Lankveld, Utrecht University, Netherlands

Inherent to adolescents' interests are the social practices in and across which pursuit takes place. Interest ecologies (the accumulated social contexts where individuals pursue their interest) are social historical rooted within the dynamic of individual, object and contexts (Akkerman & Bakker, 2019). A wide variety of interest ecologies are described in the literature, focusing on individuals' interest pursuit (Azevedo, 2011; 2013), contextual influences (Barron, 2006; Crowley, 2002), or unique interests (Gee & Hayes, 2010; Ito et al., 2018). These studies raise the question to what extent interest ecologies differ, between individuals and between interests. Akkerman and Bakker (2019) proposed seven dimensions to systematically compare interest ecologies: epistemic, temporal, geographical, material, institutional, cultural and social. Using these dimensions we mapped adolescents' interest ecologies and questioned: to what extent do adolescents' interest ecologies differ on (interrelationships between) the ecological dimensions? We detected four profiles of interest ecologies using Latent-Profile Analyses based on 828 ecologies of adolescents. We identified these as non-bounded, hybrid-socially-bounded, hybrid-institutionally-bounded and bounded ecologies. Bound ecologies seem to be more fixed on the seven dimensions compared to less fixed non-bounded ecologies. Pursuit within hybrid ecologies was observed to be simultaneously bound and non-bound. Additional analyses showed that interests can be linked strongly to a certain *boundedness* (e.g. team sports to bounded ecologies and running to non-bounded ecologies), but never unanimously. The observed bounded interest ecologies might be impossible to bring into school, making it questionable to what extent school learning can be connected to all important interests of students.

Session K 12

24 August 2021 18:45 - 19:45

Session Room 6

Poster Presentation

Higher Education, Learning and Instructional Technology

Educational Technology

Keywords: Achievement, Artificial Intelligence, Attitudes and Beliefs, Educational Technology, Game-based Learning, Higher Education, Instructional Design, Learning Analytics, Science Education, Secondary Data Analysis, Secondary Education, Self-regulation, Social Sciences, Technology

Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 16 - Metacognition

Chairperson: Marita Eva Friesen, University of Education Freiburg , Germany

Adaptive Educational Games and Their Use of Analytics – A systematic review

Keywords: Educational Technology, Game-based Learning, Learning Analytics, Secondary Data Analysis

Presenting Author:Maik Beege, Chemnitz University of Technology, Germany; **Co-Author:**Steve Nebel, Chemnitz University of Technology, Germany; **Co-Author:**Manuel Ninaus, University of Innsbruck, Austria

Research has shown that educational video games can powerful learning and teaching instruments. However, experimental and meta-research indicated numerous moderators and variables influencing the resulting learning outcomes. Recent advances in the areas of game and learning analytics potentially allow for adapting the learning environment to individual needs of the learner, features of the learning material, as well as environmental factors to foster underlying learning processes. Yet, the field of adaptive educational games is young and no clear-cut guidelines exist. Consequently, we conducted a systematic and pre-registered analysis of the literature to shed more light on this topic. In our analyses we focused on different modes of adaptivity, differences across learning domains and populations, used theoretical frameworks, research methods, as well as on the underlying measures and analytics used for realizing adaptivity. Only a small number of 10 relevant papers was identified through the systematic analysis of the literature, which emphasizes that the field is still in its infancy. The studies, though, showed promise in terms of the efficacy of adaptive educational games. Nevertheless, we identified a lack of common theoretical foundations as well as rather heterogeneous methodological approaches to investigate the effects of adaptivity. Most critical was the lack of sufficient information provided which repeatedly made it hard to draw clear conclusions. Future studies need to focus on strong theory building and follow reporting standards across disciplines. Researchers across disciplines need to act in concert to advance the current state of the field to maximize its potential.

Digital Divide and Online Risks Among Hong Kong Secondary Students

Keywords: Educational Technology, Secondary Education, Social Sciences, Technology

Presenting Author:Fred H. F. Chan, The University of Hong Kong, Hong Kong; **Co-Author:**Allan H. K. Yuen, Yew Chung College of Early Childhood Education, Hong Kong

Despite the proliferation of ICT in our everyday lives, the issue of digital divide remains underexplored in the education domain, especially the connection between the second level (uses/skills) and the third level (outcomes) divide. Based on a representative sample of 1,292 Hong Kong junior secondary students from 14 schools in the 2018/2019 academic year, this study employed Livingstone, Mascheroni, and Staksrud's (2018) model of children's Internet use to examine the associations between digital divide of ICT uses and skills with students' exposure to online risks. Results from multilevel logistic regression showed that students' online activities at home -- i) learning and practical use of the Internet, ii) content creation, iii) social media & browsing, and iv) gaming, downloading & chatting were associated with three forms of online risks -- i) security problems, ii) risky online communication, and iii) cyberbullying victimization; whereas students' digital activities at school were unrelated to any forms of online risks. Students' who were more proficient in digital literacy were less likely to

be exposed to security problems and cyberbullying victimization. Implications of findings were discussed.

Eye movements during learning of the molecular shapes with Augmented Reality

Keywords: Achievement, Educational Technology, Science Education, Secondary Education

Presenting Author:Fang-Ying Yang, National Taiwan Normal University, Taiwan; **Co-Author:**Hui-Yu Wang, National Taiwan Normal University, Taiwan

In Chemistry, concepts related to microscopic particles such as "molecular shapes" are abstract and difficult for students to observe or imagine. In the study we developed an Augmented Reality App that can show different 2D and 3D models of different molecular shapes to assist students' development of conceptual understanding on the topic. The eye tracking method was applied to examine learners' visual attention to different visual models. Relations between eye movements and conceptual understanding were then analyzed. Participants were 33 10th grade students. The pre- and post-tests were used to assess students' conceptual understanding. Statistical methods such as t-test, correlation and regression were applied. The results showed that AR activity promoted students' conceptual understanding about molecular shapes. It was also found that the cognitive effort to integrate information of 3D images is the key factor affecting the learning performance.

Users' perceptions of adopting new technologies as a guide for tailored LA tool deployment in HE

Keywords: Attitudes and Beliefs, Educational Technology, Higher Education, Learning Analytics

Presenting Author:Amanda Sjöblom, Aalto University, Finland; **Presenting Author:**Anni Silvoli, University of Oulu, Finland; **Co-Author:**Jiri Lallimo, Aalto University, Finland

As the development and implementation of new digital tools in higher education (HE) appear to be on a continual rise, we examined the attitudes and expectations of HE staff toward adoption of new digital and LA tools, and what they feel affects the adoption and usefulness of new tools. We used a mixed-methods approach to discover what factors are useful when required to take a new tool into use, and what factors can hinder the learning and use of these tools. The key motivation is to enhance deployment processes, to improve the impact of innovative solutions and tools for aiding teaching, studying and support processes, through investigating methods for wider acceptance and more skilled use in the HE population. The deployment conditions appear an opportune aspect, where improvement at a relatively easy-to-deliver level, such as good tailoring of instructions and communication of practical value, could increase the use and usefulness of digital tools for HE. The deployments appear to often fail to provide adequate, customised support, communication and instructions, and to take into account the specific needs of the users, and are not able to communicate clear use-cases and expected value. These identified short-comings provide good lessons for future projects, urging developers to invest time and effort into understanding the pedagogical and administrative processes and tasks the intended users perform, so that the tools can have a positive impact.

Real time measuring of individual learners' self regulation during learning

Keywords: Artificial Intelligence, Educational Technology, Learning Analytics, Self-regulation

Presenting Author:Rick Dijkstra, Radboud University Nijmegen, Netherlands; **Co-Author:**inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Max Hinne, Radboud University Nijmegen, Netherlands

With the increasing availability of data and Artificial Intelligence techniques, hybrid human and artificial intelligence systems can be developed. In education, this is used by Adaptive Learning Techniques (ALT) to enhance cognitive performance of learners, however this technology is still largely incapable of measuring and supporting self-regulated learning (SRL). SRL can be measured using the Moment-by-Moment Learning Curve algorithm, but this algorithm can only been used after learners complete their learning process. To make it possible for ALTs to measure and support SRL, we will develop a Dirichlet Process Gaussian Process mixture model (DPGP). The DPGP model will cluster learning behaviour from learners into groups that show comparable development. We will investigate what these clusters reveal about learners' SRL and what support is needed. With this method it will be possible to build the first Hybrid Human Artificial Intelligence Regulation system.

Increasing College Students' Depth of Knowledge: Comparing Video and Discussion Board Responses

Keywords: Achievement, Educational Technology, Higher Education, Instructional Design

Presenting Author:Suzanne Lindt, Midwestern State University, United States; **Presenting Author:**Stacia Miller, Midwestern State University, United States; **Co-Author:**Christina Janise McIntyre, Midwestern State University, United States

Educators in higher education have the responsibility to help students develop and strengthen their critical thinking skills. While there are countless strategies and tools to engage students in discussion, online video response technology may have the dynamism to motivate and engage students who are already familiar with and using this type of technology. However, the potential of this technology to enhance learning and achievement has not been compared to more traditional discussion strategies. The purpose of this research was to compare students' development of depth of knowledge using a video response platform and a traditional discussion board in a learning management system to determine whether one is more effective in eliciting intended responses. Results suggest that video response platforms hold the potential to get students thinking and responding on deeper levels.

Session K 13

24 August 2021 18:45 - 19:45

Session Room 9

Poster Presentation

Assessment and Evaluation, Higher Education, Learning and Instructional Technology, Motivational, Social and Affective Processes

Assessment Methods and Tools

Keywords: Assessment Methods and Tools, At-risk Students, Competencies, Cultural Psychology, Emotion and Affect, Higher Education, Learning and Developmental Difficulties, Learning Technologies, Misconceptions, Mixed-method Research, Model-based Reasoning, Motivation, Psychometrics, Quantitative Methods, Science Education, Special Education

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education, SIG 08 - Motivation and Emotion, SIG 15 - Special Educational Needs

Chairperson: Nanette Seago, WestEd, United States

Predicting Math and Reading Achievement Using Dynamic Testing

Keywords: Assessment Methods and Tools, At-risk Students, Learning and Developmental Difficulties, Special Education

Presenting Author:Moritz Börnert-Ringleb, Leibniz University Hannover, Germany; **Co-Author:**Jürgen Wilbert, Universität Potsdam, Germany

Dynamic assessment (DA) tries to gain insights into students' learning potentials by combining measurement and intervention within the diagnostic process. Moreover, DA aims to identify the conditions and instructional needs required for adequately supporting students in their development. Thereby, the use of DA could reduce potential influences of uneven testing prerequisites and prevent testing biases related to specific students' characteristics. The validity of dynamic testing outcomes has been confirmed in previous studies. However, the vast majority of existing research in the field of DA related to the assessment of cognitive abilities. With regard to the possible advantages of DA and shortcomings of traditional testing, the application of DA might be a promising approach in extending diagnostic practices in reading and mathematics. This contribution aims to gain insights into the advantages of the application of DA in reading and mathematics by means of a systematic literature review. 22 relevant studies were identified, which either applied dynamic testing in reading, mathematics, or cognitive abilities and predicted reading or mathematic achievement. The analysis of the studies included indicated that dynamic testing measures seem to be valid and incremental predictors of students' mathematical and reading development.

Automated versus Human Scoring of Student-Generated Models of Scientific Systems

Keywords: Assessment Methods and Tools, Learning Technologies, Misconceptions, Model-based Reasoning

Presenting Author:Yujin Tao, University of North Carolina at Chapel Hill, United States; **Co-Author:**Kihyun "Kelly" Ryoo, University of North Carolina at Chapel Hill, United States; **Co-Author:**Kathleen McCarroll, University of North Carolina, United States; **Co-Author:**Ziqian Xu, UNC Chapel Hill, United States; **Co-**

Author:Mara Negrus, University of North Carolina at Chapel Hill, United States

Automated scoring systems can support science teachers by providing an immediate assessment of open-ended student work, such as models, and enable them to provide data-driven instructional decisions. However, there is limited research on the accuracy and reliability of such scoring systems for student-generated scientific models. This study compares human versus automated scores of 1,296 student-generated models of properties of matter at the molecular level. The results show high levels of agreement for overall scores, as well as inaccurate models. Of particular interest is that the automated scoring system was able to detect various non-normative ideas students held. Overall, this study provides promising evidence for the efficiency of automated scoring systems and outlines areas for improvement.

Keywords: automated scoring, student-generated models, chemical phenomena

Development of a multilevel communication model for higher education

Keywords: Assessment Methods and Tools, Competencies, Higher Education, Quantitative Methods

Presenting Author:Kristina Walz, Justus-Liebig-Universität Giessen, Germany; **Co-Author:**Edith Braun, Justus-Liebig-Universitaet Giessen, Germany

This contribution examines a performance based role-play assessment of communication skills. The assessment is based on several theoretical facets derived from established communication theories. The facets are framed by two different ways of communication, based on Habermas (1984) theory of communicative action: strategic communication and communication-oriented-towards-understanding. The aim of this contribution is to analyze patterns in the observation ratings that describe communication skills and to examine if we can empirically validate these theoretical facets as descriptors for qualitative differences in communication competence. Our analysis is based on a data sample collected within the project "Performance-based assessment of student's communication skills" among students in Germany. The role-plays have been tested in 11 different German higher education institutions with a total of 515 students. First analysis of this empirical data confirmed the hypothesis of two different dimensions of communicational skills (ways of communication). We use IRT analysis to discover patterns in the observation surveys based on item difficulty. The results emphasizes a four-level-model of communication, equal to the assumed four-point Likert scale for almost all facets. Furthermore, the theoretical facets can be used as distinctive descriptors of these levels. The test distinguishes the competence of participants best for lower and mediocre communication skills (Competence values -2.5 to 1.5 (strategic communication) and -3.5 to 1.5 (communication-oriented-towards-understanding) with 0 as mean competence value). The model contributes to performance-based assessment in higher education. Still, the current analysis is constrained by a small number of items for some facets.

Prediction of student outcomes with broadband and narrowband dimensions of behavior

Keywords: Assessment Methods and Tools, At-risk Students, Emotion and Affect, Psychometrics

Presenting Author:Pawel R. Kulawiak, University of Potsdam, Germany; **Co-Author:**Jürgen Wilbert, Universität Potsdam, Germany; **Co-Author:**Robert Schlack, Robert Koch Institute, Germany; **Co-Author:**Moritz Börner-Ringleb, Leibniz University Hannover, Germany

The Strengths and Difficulties Questionnaire (SDQ) is a frequently used screening instrument for behavioral problems in children and adolescents. There is an ongoing controversy—not only in educational research—regarding the factor structure of the SDQ. Research results speak for a 3-factor as well as a 5-factor structure. The narrowband scales (5-factor structure) can be combined into broadband scales (3-factor structure). The question remains: Which factors (narrowband vs. broadband) are better predictors? With the prediction of child and adolescent outcomes (academic grades, well-being, and self-belief), we evaluated whether the broadband scales of internalizing and externalizing behavior (3-factor structure) or narrowband scales of behavior (5-factor structure) are better suited for predictive purposes in a cross-sectional study setting. The sample includes students in grades 5 to 9 ($N = 4642$) from the representative German Health Interview and Examination Survey for Children and Adolescents (KiGGS study). The results of model comparisons (broadband scale vs. narrowband scales) did not support the superiority of the broadband scales with regard to the prediction of child and adolescent outcomes. There is no benefit from subsuming narrowband scales (5-factor structure) into broadband scales (3-factor structure). The application of narrowband scales, providing a more differentiated picture of students' academic and social situation, was more appropriate for predictive purposes. For the purpose of identifying students at risk of struggling in educational contexts, using the set of narrowband dimensions of behavior seems to be more suitable.

An Investigation of Item Difficulties to Assess Students Multiple Representations in Work and Energy

Keywords: Assessment Methods and Tools, Psychometrics, Quantitative Methods, Science Education

Presenting Author:Fitria Arifiyanti, University of Szeged, Doctoral School of Education, Hungary; **Co-Author:**Attila Pásztor, MTA-SZTE Research Group on the Development of Competencies, Hungary

The use of multiple representations in science learning is expected to help students visualize problems and find solutions to science problems. However, there is a lack of studies investigating the difficulties of science tasks in different representations. The aim of this study is to develop an instrument to assess multiple representations in science and to analyse item difficulties related to different representations. Rasch measurement was employed to investigate items difficulties of instrument-related students' multiple representations skills. Samples were drawn from students in 11th grade ($N=178$ students) at senior high school who had already learned Work and Energy in physics. A test consisting of 5 tasks with 15 items were used to identify student ability in the form of pictorial, physics (science), and mathematics representation. Overall all items showed good reliability and validity. However, 1 item (MATH1) is misfit indicating guessing answers regardless of student abilities. Based on the comparison of representation groups, science representation is the most difficult representation of all representation with positive logit (0.348 logit) followed by pictorial representations (-0.106 logit) and mathematics representation (-0.246 logit). This finding indicates that science representation became the most difficult representations of multiple representation skills. In science learning, mathematics just a tools to understand science concept. Students suffered some difficulties in solving science concept because they did not comprehend the science concept well, especially in Work and Energy topic. Further research is needed to strengthen these results in a larger sample in order to increase generalizability of these findings.

An Emic Approach to Develop Expectancy-Value-Cost Measures of Student Motivation in Rwanda

Keywords: Assessment Methods and Tools, Cultural Psychology, Mixed-method Research, Motivation

Presenting Author:Dominik Bulla, Oxford University, United Kingdom

This poster presentation is about a bottom-up (i.e., emic) approach to develop expectancy-value-cost measures of student motivation in Rwanda that combines qualitative and quantitative methods. In study 1, open-ended data-collection exercises were administered to 165 secondary students to explore proximal (i.e., inner) drivers of motivation as well as the cognitive and affective appraisals of the self that come with confidence. Respective answers were turned into 8 different scales measuring various aspects of expectancy, value and costs beliefs around education. In a second study, exploratory factor analysis was carried out to examine the latent structure of these scales in both Kinyarwanda and maths. The emerging factor model comprised of the 4 factors of Ability, Utility, Costs, and Perceived Uselessness and fitted the data well. Replication of the results using confirmatory factor analysis within a third sample, suggests a three-factor model to fit the data best. The presentation concludes comparing the final model with Western-derived expectancy-value-cost models.

Session K 14

24 August 2021 18:45 - 19:45

Session Room 2

Poster Presentation

Assessment and Evaluation, Higher Education, Learning and Instructional Technology, Teaching and Teacher Education

Online Learning

Keywords: Assessment Methods and Tools, Computer-assisted Learning, E-Learning/Online Learning, Educational Psychology, Educational Technology, Game-based Learning, Higher Education, In-service Teacher Education, Instructional Design, Learning Technologies, Pre-service Teacher Education, Secondary Education, Self-regulation, Teacher Professional Development

Interest group: SIG 01 - Assessment and Evaluation, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 14 - Learning and Professional

Development

Chairperson: Bernadette Dilger, University of St.Gallen, Switzerland

Norwegian Teachers' Learning in MOOC: Insights into epistemic practices and teacher digital agency

Keywords: E-Learning/Online Learning, Educational Psychology, In-service Teacher Education, Pre-service Teacher Education

Presenting Author: Irina Engeness, Østfold University College, Norway; **Co-Author:** Magnus Nohr, Østfold University College, Norway

This study examined how Norwegian teachers engaged in learning in the Pedagogical Information and Communication Technology (ICTPED) Massive Open Online Course (MOOC) aimed to enhance pre- and in-service teachers' professional digital competence. The study also provides an insight into how teachers' engagement in learning in the ICTPED MOOC may have enhanced their digital agency. Analyses of teachers' engagement in learning draw on Galperin's study of orientation.

The data comprised 310 teachers' responses to the questionnaire administered to all pre- and in-service teachers engaged in the ICTPED MOOC in 2016–2019. Mixed methods were applied for data analyses by providing quantitative and qualitative evidence about the teachers' engagement in the course.

Findings reveal that the majority of teachers engaged in learning by reading the textual information embedded in the course. In doing so, they followed the sequential progression informed by the course design. Other teachers engaged in learning by watching the videos and listening to the audio files embedded in the course as well as by attempting the assignments and other activities. By following these approaches, the teachers created their individual learning trajectories and therefore may have enhanced their digital agency and affected the epistemic practices in the course.

Comparison of digital and analog learning environments to foster self-regulated learning

Keywords: E-Learning/Online Learning, Game-based Learning, Pre-service Teacher Education, Self-regulation

Presenting Author: Nathalie Zetzmann, Saarland University, Germany

Learning with digital media is a current topic in educational institutions. Given that the use of e-learning and educational games in school increases, it necessitates the promotion of abilities which support academic achievement, such as self-regulated learning (SRL), through digital learning environments. Therefore, the aim of this quasi-experimental study is to examine the differences between two digital learning environments (game-based learning (GBL), e-learning) and an analog seminar in regard to support SRL. Three intervention groups (GBL, e-learning, analog seminar) were created based on Zimmerman's model of SRL (2000) and will be compared to a passive control group (CG). It is hypothesized that there will be an increased use of SRL-strategies and an improvement in declarative knowledge of SRL for all intervention groups compared to the CG. It is expected that participants in the GBL group will use more SRL-strategies and will have higher declarative knowledge in the posttest than the e-learning and seminar conditions, which will not differ in those variables. Data will be collected in summer term 2021. To test the hypotheses, a repeated measures MANOVA will be conducted for the use of SRL-strategies and a repeated measures ANOVA will be conducted for declarative knowledge of SRL. The results will be discussed in regard to scientific consequences and in reference to offer recommendations for the development of prospective digital learning environments. Zimmerman, B. J. (2000). Attaining Self-Regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Hrsg.), *Handbook of Self-Regulation* (S. 13–39). Academic Press.

REST: A MOBILE APPLICATION TO EMPOWER TEACHERS' RESILIENCE

Keywords: E-Learning/Online Learning, In-service Teacher Education, Pre-service Teacher Education, Teacher Professional Development

Presenting Author: Maria Platsidou, University of Macedonia, Greece; **Co-Author:** Athena Daniilidou, University of Macedonia, Greece; **Co-Author:** Georgia Diamantopoulou, University of Macedonia, Greece; **Co-Author:** Paul Hatzigiannakoglou, University of Macedonia, Greece

The REST (Resilience in Educators, Schools and Teaching) is an interactive online learning program designed to help teachers build their awareness of the skills and practices empowering their resilience at work. It is addressed to both pre-service and practicing teachers. Based on similar programs available in the international literature, in its current form, the REST contains two online interactive learning modules. The first presents a description of resilience with emphasis on the factors that can impact teachers' resilience; also, the role of resilience in teachers' personal and professional lives is pointed out. The second module refers to the social dimension of resilience and its impact on school life. Throughout the modules, participants can complete a self-evaluation of their resilience, learn ways and strategies to improve it, get tips from experienced teachers and experts and find suggestions for activities, books and movies promoting resilience at a personal or professional level. The REST is available as a mobile application (app) for Android tablet and mobile devices and is freely available (in Greek) on Google play.

Secondary school teachers' online FA practice (during Covid-19 lockdown)

Keywords: Assessment Methods and Tools, E-Learning/Online Learning, Secondary Education, Teacher Professional Development

Presenting Author: Marijke Veugen, Wageningen University and Research Centre, Netherlands; **Co-Author:** Judith Gulikers, Wageningen University, Netherlands; **Co-Author:** Perry den Brok, Wageningen University and Research Centre, Netherlands

This study shows how secondary teachers developed and changed their formative assessment (FA) practice during their online teaching experience in the first Covid-19 lockdown period in the Netherlands. This lockdown created challenges as well opportunities for teachers to use FA online. In this study three questions are answered: What did teachers change in their FA practice? What advantages and disadvantages does online FA have? And what lessons have teachers learned from using FA online? This study qualitatively investigated 53 secondary school teachers' FA practice via an online questionnaire, online interviews and webinars during a period of school closure. The FA-cycle was used as analytical framework to describe teachers' online FA activities within five aligned phases of the FA process. The data were transcribed and coded in Atlas-ti based on this framework by two researchers and checked for interrater reliability. Results showed that teachers used learning goals and success criteria to guide online teaching and learning, used different online tools to gather information about the students learning process, presented this information in a cohesive way, provided more individual feedback to students and created online opportunities for students to apply their feedback in new assignments. Teachers also experienced that using FA online created more opportunities for individual help. However, teachers found it more difficult to monitor student learning. Many teachers intended to apply more technology in their FA practice after the lockdown period.

Investigating the effects of learner characteristics and Instructional Design in online learning

Keywords: Computer-assisted Learning, E-Learning/Online Learning, Higher Education, Instructional Design

Presenting Author: Lisa Holzer-Schulz, University of Regensburg, Germany; **Co-Author:** Silke Schworm, University of Regensburg, Germany

College students' acceptance of learning environments and their performance in online courses can be increased by considering learner characteristics and designing engaging virtual arrangements with methods like learning through micro content or through collaboration. The aim of the study is to investigate the effect of students' learner characteristics and the Instructional Design of an online learning environment on the students' acceptance of an online course and on the students' performance. Accordingly, two different online courses – one Micro Learning and one Computer-supported Collaborative Learning environment – were implemented and specific learner characteristics (current motivation, epistemic beliefs and Technology acceptance) were assessed. 205 teacher students took part in the treatment. Results showed that the Instructional Design does neither affect students' acceptance of the online course nor their performance as much as specific learner characteristics do. Students' interest and their actual usage of technology has a significantly positive influence on the acceptance of the online course, while the fear of incompetence and social influence on technology acceptance behavior has a significantly negative effect on it. The certainty of knowledge is a significantly negative predictor for the students' performance. These findings offer different practical implications for online teaching in higher education.

Teachers' Role in Promoting Self-Regulated Learning Using Digital Media

Keywords: E-Learning/Online Learning, Educational Technology, Learning Technologies, Self-regulation

Presenting Author: Désirée Fahrni, Pädagogische Hochschule Schwyz, Switzerland; **Co-Author:** Doreen Prasse, Schwyz University of Teacher Education, Switzerland; **Co-Author:** Glenna Iten, Pädagogische Hochschule Schwyz, Switzerland; **Co-Author:** Tina Hascher, University of Bern, Institute of Educational Science, Switzerland

Self-regulated learning refers to a conceptual framework which integrates cognitive, metacognitive, and regulative components into a self-regulated learning

process (Boekaerts, 1999; Zimmerman & Moylan, 2009). For all groups of learners, the promotion of self-regulated learning is important. Thus, teachers systematically need to introduce opportunities for self-regulated learning to learners and support them during their learning processes. Self-regulated learning can be promoted in a direct or indirect way (Dignath & Büttner, 2018; Dignath & Veenman, 2020) and digital media can offer opportunities to promote self-regulated learning (Devolder, van Braak & Tondeur, 2012; Wong et al., 2019). Research has revealed different approaches to promoting self-regulated learning with digital media. However, there is a paucity of knowledge about the effectiveness of these approaches with regard to the teachers' role. Therefore, this systematic review aims at providing an overview of studies that focus on promoting self-regulated learning with digital media in younger learners and the teachers' role. The systematic review followed the four steps of the PRISMA Flow Diagram developed by Moher et al. (2015) and will introduce the current state of research with a specific focus on teaching effectiveness. Preliminary results show that high quality teacher-student interactions are essential in technology-enhanced teaching settings to promote self-regulated learning. Researchers and teachers need to know what aspects of digital media support self-regulated learning and how the teachers' support needs to be embedded into a technology-enhanced teaching setting.

Session K 15

24 August 2021 18:45 - 19:45

Session Room 4

Poster Presentation

Assessment and Evaluation, Culture, Morality, Religion and Education, Teaching and Teacher Education

Teacher Professional Development

Keywords: Achievement, Assessment Methods and Tools, Content Analysis, Cooperative/Collaborative Learning, Higher Education, Knowledge Creation, Pre-service Teacher Education, Quasi-experimental Research, Reflection, Religious Studies, School Effectiveness, Teacher Effectiveness, Teacher Professional Development, Technology

Interest group: SIG 11 - Teaching and Teacher Education, SIG 19 - Religions and Worldviews in Education, SIG 23 - Educational Evaluation, Accountability and School Improvement (merged with SIG 18)

Chairperson: FOTINI POLYCHRONI, National and Kapodistrian University of Athens, Greece

Effectiveness of follow-up classroom observations after school inspections in Northern Germany

Keywords: Assessment Methods and Tools, School Effectiveness, Teacher Effectiveness, Teacher Professional Development

Presenting Author: Inga Wagner, University of Koblenz-Landau, Germany

School inspection is an external evaluation method that aims to promote the improvement of instruction in several European countries. One typical feature of a school inspection is classroom observation. In order to improve the effectiveness of school inspections in enhancing classroom practices in Lower Saxony (a large federal state in Northern Germany), a follow-up classroom observation was implemented at several secondary schools. The aim of the current study was to evaluate the effects of this treatment on lesson development and its perceived usefulness using an online questionnaire. In total, 436 teachers in the treatment group and 161 teachers in the control group participated in the study. The results show a very small effect of follow-up classroom observations on lesson development in schools. Teachers rate the usefulness of this intervention as rather low. However, follow-up classroom observations seem to have a larger impact on lesson development in schools with a lower level of cooperation among teachers.

Tacit dimensions of religious teacher praxis: a research project

Keywords: Knowledge Creation, Reflection, Religious Studies, Teacher Professional Development

Presenting Author: Cristian Simoni, University of Padua, Italy

Are there specific tacit dimensions of the praxis of the religious educational figures? Could it be said this kind of educator is able also to operate a sort of secular translation in educational praxis of his religious wisdom and background? In fact, as Habermas wrote, Christian biblical-theological perspectives have been many times 'translated' from their previous confessional form in a more lay and, I add, practical one [Habermas, 2005]. With this paper I'd like to connect initially the present theoretical research with the idea of tacit knowledge and practice launched once by M. Polanyi, but I'd like to decline it in the sense of what a religious figure can specifically put in his educational praxis. The hypothesis is that previous religious experiences and previous personal reflections upon religious-biblical wisdom have a positive and secular impact inside the practice of a religious teacher/educator. The first theoretical results consist in a scheme representing the possible dimensions through which the researcher could become able to identify the *loci* of the tacit dimensions of religious educational figures. The aim of the research is double: firstly, it's my intention to provide a theoretical background for a different in-service-learning workshop for religion teachers, in which their tacit knowledge and practices could emerge and been socialized and also become matter of the same in-service formation. The second aim is broadly cultural: to witness the secular usefulness of a religious background for good educational practices, that is, for the common good and citizenship.

Evaluating New Approaches in Initial Teacher Training — Mentorship programs in School Practice

Keywords: Achievement, Pre-service Teacher Education, Teacher Effectiveness, Teacher Professional Development

Presenting Author: Stefan Kulakow, University Greifswald, Germany; **Co-Author:** Diana Raufelder, University Greifswald, Germany; **Co-Author:** Frances Hoferichter, University Greifswald, Germany

In teacher education (TE), there is an ongoing debate how to better foster students' competence development, so that they do not experience the practice shock when they make the initial practice experiences in school. With the aim to better support students in this respect, the federal funding program "Qualitätsoffensive Lehrerbildung" has resulted in a statewide implementation of new approaches to a) better connecting theory and practice, b) establishing mentorship programs, c) fostering reflective processes with the students. The present study aims at evaluating the effectiveness of these new approaches by evaluating students' competence development during their practical training in schools. The present study consists of 187 students in initial TE ($M_{age} = 24.5$, $SD = 4.54$; 68% female) who completed standardized survey instruments. All students were surveyed three times (T1: before practical training; T2: during practical training; T3: after practical training). 120 students were part of the experimental group (EG) and 67 of the control group (CG). Students of the CG had practical training without the new approaches. Longitudinal multilevel modeling was performed in Mplus to examine whether the reformed practical programs resulted in increased reported teacher competences. Overall, the results of the study highlight the importance of early practical training and professional support during students' practical training. Over time, self-reported competences increased for all measured competence domains (i.e., teaching, education, assessment, innovation) for both students from EG and CG. However, students that were professionally supported during their practical training reported increased competences for teaching, education, and assessment compared to students from the CG.

Does Reverse Mentoring promote (pre-service) teacher competence regarding digital media?

Keywords: Cooperative/Collaborative Learning, Pre-service Teacher Education, Quasi-experimental Research, Teacher Professional Development

Presenting Author: Franziska Baier, Goethe-Universität Frankfurt, Germany; **Co-Author:** Julia Dohrmann, Goethe-University Frankfurt, Germany; **Co-Author:** Charlotte Dignath, DIPF Leibniz Institute for Education Research Frankfurt, Germany; **Co-Author:** Katja Knuth-Herzig, German University of Administrative Sciences Speyer, Germany; **Co-Author:** Mareike Kunter, DIPF | Leibniz Institute for Research and Information in Education, Germany

The aim of this intervention study is the systematic and sustainable improvement of pre-service and in-service teachers' digital competence. The intervention targets aspects of teachers' professional competence concerning digital media such as professional knowledge and beliefs that seem crucial for the effective use of digital media in teaching.

We use Reverse Mentoring as a teaching method in a joint intervention that addresses pre-service and in-service teachers: pre-service teachers, who are probably more familiar with digital media due to their higher personal use of digital media, pass on their knowledge and experience with digital media to experienced teachers; in-service teachers, in turn, share their classroom expertise with pre-service teachers, who are less experienced in teaching practice and pedagogical content knowledge. Together, both groups are to develop ideas for using digital media effectively in the classroom and, thus, build a basis for

closing each group's competence gaps.

We will investigate the effectiveness of Reverse Mentoring for pre-service and in-service teachers in the context of digital media use in the classroom by combining an initial teacher training course (TT) with a professional development (PD) course for in-service teachers. To assess the benefit of collaboration between both groups compared to collaboration per se, we conduct a series of intervention studies that will compare a traditional course with a course using collaborative learning (1) in TT (only pre-service teachers), (2) in PD (only in-service teachers), and (3) a combined TT/PD course (Reverse Mentoring). We present the design of the intervention studies and first results.

The design of a professional development initiative for university teachers

Keywords: Content Analysis, Higher Education, Reflection, Teacher Professional Development

Presenting Author: Britt Adams, Ghent University, Belgium; **Co-Author:** Laura Monique Thomas, Ghent University, Belgium; **Co-Author:** Martin Valcke, Ghent University, Belgium

Traditionally, university teachers have been mainly identified as content experts. Over the past decades, however, there has been a shift in thinking in favour of university teachers being both content experts and facilitators of students' learning processes. This study reports on the design of an evidence-based professional development intervention aimed at improving university teachers' competences to facilitate the learning processes of students. In the period October 2019 – March 2020, 106 teachers participated in the intervention. Qualitative analyses of written teacher reflection forms and evaluation sheets were carried out to discover which intervention features of the *anonymized* professional development programme deserve closer attention according to university teachers. Preliminary results revealed interesting challenges related to issues such as *ownership* and a *safe learning climate* in the context of a professional development programme.

A Pre-Service Math Teacher's Professional Identity Development Trajectory through Online Reflections

Keywords: Pre-service Teacher Education, Reflection, Teacher Professional Development, Technology

Presenting Author: Amine Merve Ercan, Middle East Technical University, Turkey; **Co-Author:** Nur Akkus Cakir, Middle East Technical University, Turkey

This is a qualitative intervention case study of a pre-service Math teacher aimed to develop an understanding of the trajectory of the professional teacher identity development of a pre-service Math teacher as reflected by her online anticipatory writing posts. Using a framework of a teacher identity development and online reflection platforms, the student was guided to reflect on her personality, belief, and experiences about teaching and learning. The data was collected through two different data sources: WordPress and Edmodo. The data was composed of weekly reflections of one student for 10 weeks, teaching philosophy statement was written at the beginning and end of the term. During this period, the case shared her reflections with her classmates and she had an opportunity to read the reflections of her peers. She also participated in 3 discussion forms regarding 3 popular educational TEDTalks on Edmodo. Her discourses on both platforms were analyzed by two coders and then discussed together using a consensus approach to identify major themes, as the evidence of how her professional identity developed thought out the term. The findings emphasized the importance of anticipatory reflective writing in the development of the professional teacher identity of pre-service maths teachers and the multiple and dynamic nature of the teacher identity. Additionally, results highlighted the effect of online discussions on the teacher candidate's self-definition.

Session K 16

24 August 2021 18:45 - 19:45

Session Room 3

Poster Presentation

Assessment and Evaluation, Educational Policy and Systems, Learning and Instructional Technology, Learning and Social Interaction

Vocational Education and Workplace Learning

Keywords: Action Research, Case Studies, Comprehension of Text and Graphics, Goal Orientation, Informal Learning, Lifelong Learning, Literacy, Phenomenography, Qualitative Methods, Reflection, Teaching/Instruction, Technology, Vocational Education, Workplace Learning

Interest group: SIG 09 - Phenomenography and Variation Theory, SIG 14 - Learning and Professional Development

Chairperson: Gillian Lake, DCU, Ireland

Citizenship education, labour market needs and the technical education in Sierra Leone

Keywords: Case Studies, Phenomenography, Vocational Education, Workplace Learning

Presenting Author: Alberto Nagle Cajes, Independent Consultant, Uruguay

I. Purpose of the studyThe purpose of the present paper is to twofold. 1) study the perspective of relevant stakeholders regarding the features of the formation of TVET graduates in Sierra Leone and 2) the desired and required competencies of the employees in the different companies. We conducted a phenomenographic study aimed to understand the conceptions and perspectives of the employers. We conducted 12 deep interviews with CEOs or responsible for human resources areas of 12 companies located in Freetown in September-October 2020. The interviewees expressed their ideas about the features of the TVET graduates.The second part of the study was a replication of the typology developed in a survey in the European Union by Varga, Szira, Bárdos and Hajós regarding labour market competencies. We also introduced some new items in order to adapt to local conditions. We elaborated a questionnaire that was sent electronically to 40 companies. The survey collected information about competencies, area of business and employees. The interviews and the qualitative information collected were analyzed according to the phenomenographic research approach developed at the University of Gothenburg, Sweden. The aim is to discover the qualitatively different ways in which people experience, conceptualize, realize, and understand various aspects of phenomena in the world around them. Varga, Szira, Bárdos & Hajós typology showed that the entrepreneurs prefer employees with solid moral and ethical competencies than technical skills for working in their companies. This result is very interesting and, should be incorporated in the curriculum design of VET institutions in Sierra Leone.

Digital learning arrangements in VET within the Swiss pharmaceutical industry

Keywords: Case Studies, Teaching/Instruction, Technology, Workplace Learning

Presenting Author: gaby walker, Eidgenössisches Hochschulinstitut für Berufsbildung, Switzerland; **Co-Author:** Antje Barabasch, EHB, Switzerland

LifeScience and pharmaceutical industry in the Basel Area are committed to VET with over thousands of learners in 14 different professions. A comprehensive and explorative case study was conducted to elucidate to what extent digital innovations apply to VET. The study was performed at F. Hoffmann-La Roche and aptenias which supports 85 member companies in the Basel Area. Semi-structured interviews were held with apprentices, workplace trainers, trainers in inter-company courses, training officers, training managers and VET management A total 102 individual interviews, 3 focus group interviews and 5 site visits were pursued. Data were analyzed by a content analysis. Innovative approaches to change the learning culture in VET could be identified. (i) A Digitmentor creates an E-learning path with different learning units. Learners can independently determine the sequence and time demands of the individual items. Each item contains several tasks, a learning video or a learning control. The trainer can correct or comment on tasks at any time or only intervene in a supportive manner. This allows individual coaching, depending on the learning performance, learning speed and specific skills of the apprentice. (ii) The use of a Web-based authoring tool which can be equipped with job-specific short units, such as learning videos and technical texts from instructors. Trainees use the system via cell phones or tablets as a pre- or post-class preparation for regular classes. Individualized E-learning cards of the material can also be created, which allows the recording of knowledge and a review of units as needed.

In-Service versus Pre-Service Teachers' Understanding of Learning Progress Assessment Data

Keywords: Comprehension of Text and Graphics, Literacy, Qualitative Methods, Vocational Education

Presenting Author: Wiebke Vorpahl, University of Hohenheim, Germany; **Co-Author:** Julia Warwas, University of Hohenheim, Germany

Since learning progress assessment data (LPAD) can serve to support learning in school, it is important to understand such data accurately. However, extant

studies report rather heterogeneous reading skills among both qualified and prospective teachers (Espin et al. 2017; Zeuch et al. 2017, Wagner et al. 2017). Consequently, more research is needed to specify the extent to which teachers make use of information inherent in LPAD (Stecker 2017). Furthermore, the question remains whether certain groups of teachers differ in their skills of reading LPAD, since pedagogical experience seems to be a negligible determinant (Zeuch et al. 2017). In our study, we displayed LPAD-graphs to pre-service and in-service teachers in vocational education and compared their reading skills on various dimensions. We asked participants (N = 63) to verbalize their thoughts on the presented data. The graph depicted a student's learning progress under different instructional methods with reference values such as average class achievement and learning objective. Think-aloud-protocols reveal which information participants noticed consciously and in which sequential order they proceeded. To analyze the protocols, we use a category system based on data literacy theory. Main categories are "Framing", "Read the data", "Read between the data", "Read beyond the data", "Accuracy" and "Completeness". Preliminary results show that all participants concentrated on reading between and beyond the data but in-service teachers paid comparably more attention to framing prior to interpretative steps. Nevertheless, pre-service teachers retrieved quantitatively more and also slightly more accurate information from the diagram.

Experiments as a means to cater for better transfer in continued professional development

Keywords: Action Research, Qualitative Methods, Reflection, Workplace Learning

Presenting Author:Sofie Kobayashi, University College Copenhagen, Denmark

This project aims to enhance the impact of continued professional development by engaging participants in experimenting with their practice, collecting and analysing data from their experiments, and act as peer reviewers on one another's experiments. The research will investigate what factors hinder and support transformative learning and transfer to practice in this approach to continued professional development, based on active experimenting in practice. We consider transfer to be a continued learning process, and boundary crossing as a learning opportunity. The context is the Danish primary and lower secondary school (basic school), and participants are leaders who are required to develop their competences in instructional leadership and build their competence and confidence to engage in discussions of curriculum and pedagogy with the teachers. Participants will be co-researchers in this action research project, and data collected through the experiments as well as through common reflection sessions and interviews.

Learning to work autonomously throughout the apprenticeship at the Swiss Postal Service

Keywords: Case Studies, Teaching/Instruction, Vocational Education, Workplace Learning

Presenting Author:Antje Barabasch, EHB, Switzerland; **Co-Author:**Fabio Briante, EHB, Switzerland

Companies, who show honest concern for their employees' need for autonomy, establish work conditions, under which well-being and agency flourish by positively affecting job-engagement, knowledge sharing and creativity. Autonomy-support by supervisors in VET facilitates socialization within organizations by contributing to the satisfaction of newcomers' basic psychological needs. The presentation addresses how companies and vocational trainers respond appropriately to this vital, basic psychological need based on a qualitative case study conducted at the Swiss Postal Service. We review some of the supervising methods of workplace trainers and training measures at the Swiss Postal Service. The study inquired about the experience of autonomy of apprentices as well as about institutional enablers. In total, 12 apprentices, 19 trainers and coaches, three employees responsible for the apprentices' vocational education and two managers were interviewed by means of a semi-structured interview guideline. Data were processed using a qualitative content analysis. Three topics related to the support of autonomy have been identified: a) opportunities to take ownership, b) choice and participation concerning learning activities, and c) experiences of having a voice. Conducive training measures include self-study time at enterprise, work in specific teams of apprentices, organizing one's work in the framework of particular work conditions and requirements, language course support, inclusion in Kaizen, as well as participation in the apprentice union. Overall, there is a range of measures in place which successfully support autonomy at the workplace, because it is a highly ranking competence within apprenticeship training.

Exploring performance feedback experiences of residents working at a COVID-department

Keywords: Goal Orientation, Informal Learning, Lifelong Learning, Workplace Learning

Presenting Author:Marije Lesterhuis, University of Antwerp/ Spaarne Gasthuis, Netherlands; **Co-Author:**Marijke Eurelings, Spaarne Gasthuis, Netherlands;

Co-Author:Marieke van der Schaaf, University Medical Center Utrecht, Netherlands; **Co-Author:**Reinier Hoff, University Medical Center Utrecht, Netherlands

In hospitals, residents from different disciplines have to work in the COVID-department. Meanwhile, workplace learning is the key pillar of their curriculum and feedback is an important driver of learning. This pilot study explores the feedback experiences reported by five residents at a COVID-department in a hospital in the Netherlands. For five consecutive days, they filled in a questionnaire about performance feedback they received from their colleagues and patients. Results show that the number of feedback experiences differs per day, rather than per resident. All residents reported different sources of feedback. Most performance feedback was perceived to be relevant, but did not provide new insights. According to the residents this was due to the generic character of the feedback. A practical implication to increase the value of performance feedback is to formulate residents' learning goals during their time at the COVID-department. This might guide the seeking, perception and giving of more specific feedback.

Session K 17

24 August 2021 18:45 - 19:45

Session Room 15

Invited Symposium

Culture, Morality, Religion and Education

SIG 13: Moral and Democratic Education in an Age of Extremism

Keywords: At-risk Students, Citizenship Education, Cultural Diversity in School, Educational Policy, Mixed-method Research, Qualitative Methods

Interest group: SIG 13 - Moral and Democratic Education

Chairperson: Hazel Bryan, University of Huddersfield, United Kingdom

Organiser: Eveline Gutzwiller-Helfenfinger, University of Fribourg, Switzerland

Discussant: Paul Thomas, University of Huddersfield, United Kingdom

Radicalisation and extremism are now increasingly addressed in education policy at government, regional and school levels globally. Similarly, radicalisation and extremism are beginning to be present on the curriculum in schools and colleges widely. This Invited Symposium aims to explore the challenges faced by moral and democratic education in developing the political citizen in relation to radicalisation and extremism. Our papers variously explore ontological and structural problems in counter-terrorist, anti-extremist education policy, the potential maladjustment of the children of Muslim convicted extremists in the Russian context, the threat of a chilling effect on the development of free speech and self-identity of the young person and the ways in which counter-terrorist, anti-extremist education policies position students, teachers and the curriculum on a continuum of securitisation, safeguarding and democratic approaches to education.

Muslims, Security and the Question of 'Prevent'

Presenting Author:Shamim Miah, University of Huddersfield, United Kingdom

Prevent has long been associated with a Manichean view of the world - an ideological struggle between forces of 'good' against impulses of 'darkness'. This logic is so deeply engrained in the Prevent logic that any criticisms are automatically conflated with the support of terrorism. The Prevent part of Government's CONTEST (HM Government 2006) strategy has undergone a complex evolution. The first stage of Prevent (2001-2006) focused on using a community relations approach to win the *hearts and minds* of the Muslim community. The second stage approach (2007-2010) changed its focus in light of the London bombings of 7/7, by aiming to tackle violent extremism. The third stage (2011-2015) made the judgment of tackling non-violent forms of extremism – thus conflating non-violent with violent forms of extremism. The fourth stage of Prevent (2015-2018) ensured that Prevent became a legal duty for all public sector organisations. The question of Prevent has a number structural and ontological problems associated with it; this paper aims to offer an ontological and epistemological critique of tackling radicalisation in schools.

Muslim Children at Risk of Social Maladjustment: Developing a New Method to Study a Blind Spot

Presenting Author:Kamil Nasibullov, Academy of Sciences of the Republic of Tatarstan, Russian Federation; **Co-Author:**Natalia Kopylova, Kutafin Moscow State Law University, Russian Federation

The social problem of Muslim children whose parents or parent are imprisoned for terrorist or extremist acts in Russia is an under-researched area. The risks of social maladjustment of children in this situation are significant but as yet, poorly understood in both research and practice. Children in such circumstances are likely to suffer stigmatization, particularly in the light of increased focus on radicalisation in Russia. This research has a focus on teachers and educational psychologists and makes recommendations for practice in terms of an increased understanding of Muslim culture and increased knowledge and skill to understand and address the issues the children are dealing with in the school setting and beyond.

Chilling the student voice? Counter-terrorism policy and the 'political citizen' in English Schools

Presenting Author:Paul Thomas, University of Huddersfield, United Kingdom

An internationally-unique feature of the UK's counter-terrorism policy approach has been the placing from 2015 onwards of a formal legal duty on all educators and their institutions to implement the counter-terrorism 'Prevent' Strategy. Already highly-controversial because of its original, overt targeting of British Muslim communities, this new 'Prevent Duty' has provoked very considerable media and political debate. Alongside a renewed accusation of Muslim stigmatisation and consequent damage to social cohesion has been the suggestion that this Prevent Duty is 'chilling' free speech and the expression of opinion and self-identity amongst students, particularly those of Muslim background. This paper draws on the first national research study on how educators in English schools and colleges have understood and enacted the Prevent Duty to consider the impacts of these counter-terrorism requirements on debate and free speech by students, and on how this policy enactment relates to academic evidence around effective education against extremism (Davies, 2008).

Securitised, safeguarding and democratic themes in counter-terrorist education policies

Presenting Author:Hazel Bryan, University of Huddersfield, United Kingdom; **Co-Author:**Lynn Revell, Canterbury Christ Church University, United Kingdom; **Co-Author:**Andrea Szukala, Institute of Political Science (IfPol), Univ of Muenster, Germany

The Federal Ministry of the Interior, Building and Community has identified counter-terrorism as a major policy focus for German society; legislative, organisational and social policies have been developed in counter-terrorism. In the UK, Prevent, the Counter-Terrorism and Security Act 2015 and the Teachers' Standards (DfE 2012) have been developed by the Home Office and Department for Education to include educators in a prevention approach. This research takes as its starting point the most recent counter-terrorist and anti-radicalisation education policies in Germany and the UK. The policies have been interrogated through the lenses of securitisation, safeguarding and democratic education approaches in order to identify the ways in which students, teachers and curricular are positioned from a policy perspective. A typology of emergent themes has been developed as a tool to interrogate education policy in relation to radicalisation and extremism.

Session L 1

25 August 2021 09:00 - 10:00

Session Room 8

Poster Presentation

Instructional Design, Learning and Social Interaction, Teaching and Teacher Education

Argumentation

Keywords: Argumentation, Attitudes and Beliefs, Conceptual Change, Conversation/Discourse Analysis, Early Childhood Education, Educational Psychology, History, In-service Teacher Education, Literacy, Peer Interaction, Reasoning, Science Education, Social Aspects of Learning and Teaching

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Kati Sormunen, University of Helsinki, Finland

Effects of dialogic education: traces of dialogism in teachers' small stories

Keywords: Argumentation, Conversation/Discourse Analysis, Educational Psychology, In-service Teacher Education

Presenting Author:Benzi Slakmon, Tel Aviv University, Israel; **Co-Author:**Orly Shapira, Tel Aviv University, Israel

Narrative is a socio-cognitive scheme, an organizing principle of human activity and a means of meaning making. From a sociocultural perspective on learning, it is assumed that changes occurring in utterers' structures of language reflect learning, thus could be used to identify learning traces. In this study we explore the narrative structure of a group of teachers engaged in dialogic education professional development program to identify its characteristics and temporal changes associated with the appropriation of the dialogic framework. A novel analytic framework for the analysis of dialogic traces in small stories has been developed and implemented on the extracted small stories produced in a two yearlong teachers' professional development dialogic education program. Our findings indicate that the number of relational, dialogic in nature, small stories produced by teachers increased over time, suggesting that the exposure to dialogic theory and pedagogies does influence teachers' narration. This implies that meaning making devices do have the potential to change and develop over a relatively short period of time. We believe that even minor changes towards more dialogic narration are fundamental and of great importance. Yet, the findings do not support a radical interpretation according to which teachers' perceptions have changed in the course of time, from monologic to dialogic, because dialogic small stories were already produced by the teachers during the first time period, before the TPD program had any effect. Implications for teacher education and professional development programs are discussed.

Students' arguing skills: impact of teaching beliefs and students' epistemological understanding

Keywords: Argumentation, Attitudes and Beliefs, History, Reasoning

Presenting Author:Iris Hulders, Ghent University, Belgium; **Co-Author:**Michiel Voet, Ghent University, Belgium; **Co-Author:**Bram De Wever, Ghent University, Belgium

We examined (1) the epistemological understanding of history of 942 students and (2) the beliefs on teaching historical reasoning skills of 24 teachers in lower secondary education using twice a framework of Voet and De Wever (2016). The main aim of the study was to examine the influence of both variables on students' arguing skills. Student-data were collected using a document-based essay about the murder of the Roman emperor Claudius and teacher-data were collected by teachers describing their own practice and how they implement historical reasoning in class. Our research suggests that only half of the students in lower secondary education are evaluativists and that most teachers see teaching historical reasoning skills as evaluating. Further, our study indicates that only teachers' beliefs on teaching historical reasoning seem to have a significant effect on students' arguing skills. Students whose teachers have an understanding or evaluating view on teaching historical reasoning in class, score significantly lower on arguing skills compared to students from teachers with an investigating view on historical reasoning. Students' epistemological understanding of history seems to have no significant effect on students' arguing skills. Being an absolutist or a multiplist only showed a non-significant negative relation with arguing capabilities compared to evaluativists.

Reasoning in early years – the role of animations in children's play with building blocks

Keywords: Argumentation, Early Childhood Education, Peer Interaction, Social Aspects of Learning and Teaching

Presenting Author:Ove Bergersen, Department of Early Childhood Education, Norway

Children's play with building blocks have had a central position from the very start of early childhood education. This explorative study discusses the reasoning involved in 1–2-year-olds' block play based on 19 video-recorded observations from a public kindergarten in Norway. Animations have by researchers inspired by Bakhtin been conceptualised as a heteroglossic 'layering of voices' and by researchers in the tradition of Goffman as an internal stratification of verbal discourse. It has been suggested that such animations might play a role in adults' communication with new-born children. Our results indicate that children's pre-verbal animations of block play actions and block patterns can be used as a reference point in studying young children's reasoning. The reasoning involved is discussed in the process of selecting, manipulating, and completing block play, and similarities and contrasts in block characteristics seemed to be guiding principles for the involved reasoning. The findings support a complex picture of reasoning in early years. We argue for the relevance of animations in

argumentation theory, and for educational practices.

Text-Based Dialogic Pedagogy in Early Childhood Classrooms: Mapping the Landscape

Keywords: Argumentation, Early Childhood Education, Literacy, Reasoning

Presenting Author:Ian A.G. Wilkinson, Ohio State University, United States; **Co-Author:**Leah Groom-Thomas, Ohio State University, United States; **Co-Author:**Joowon Lee, Ohio State University, United States

Most research on dialogue-intensive pedagogies has focused on teacher-student interactions in upper elementary school and beyond (grade 4 and above). Although rich language experiences have been shown to be important for young children's oral language and comprehension development, little is known about classroom discussions in early childhood settings and their impact on higher-level outcomes such critical thinking, reasoning, metacognition, and argumentation. Even less is known about discussions involving texts in these settings. The aim of this paper is to provide a comprehensive review of empirical research on text-based discussion in early childhood classrooms (defined as preschool through grade 2) to provide direction for research on dialogic pedagogy with very young children. We address three questions: 1) what pedagogies have been used, 2) what is the age/grade distribution of studies, and 3) what outcomes have been measured? Findings show that the majority of studies have been conducted with preschool children and that ideal contexts for promoting dialogic interaction with young children involve some form of story-book reading or philosophical inquiry. Research is less clear on how best to measure the specific benefits of such pedagogies.

Students' Scientific Evaluation of Astronomy Concepts

Keywords: Argumentation, Conceptual Change, Reasoning, Science Education

Presenting Author:Archana Dobarla, Temple University, United States; **Co-Author:**Janelle Bailey, Temple University, United States; **Co-Author:**Svetlana Mohan, University of Maryland, College Park, United States; **Co-Author:**Timothy Klavon, University of Maryland, College Park, United States; **Co-Author:**Josh Medrano, University of Maryland, College Park, United States; **Co-Author:**Joshua Jaffe, University of Maryland, College Park, United States; **Co-Author:**Doug Lombardi, University of Maryland, College Park, United States

Students often encounter alternative explanations about scientific phenomena. However, inconsistent with scientific practice, students may not be critically evaluative when comparing alternatives. The Model-Evidence Link (MEL) diagram is an instructional scaffold that facilitates critical evaluation by letting students compare evidence and make connections between evidence and competing explanatory models. This study compares two activities where students weighed connections between lines of evidence and explanations in astronomy. In the first, high school students and preservice teachers were given four lines of evidence and two models about the Moon's formation (MF pcMEL). In the second, students chose two out of three possible models and four out of eight lines of evidence about the origins of the Universe (OR baMEL). Repeated measures of analysis of variance (ANOVA) showed a positive shift in both plausibility of the scientific model and knowledge. Overall, there was a positive shift in knowledge for pre- to post-instruction and the effect of instruments (pcMEL vs. baMEL) was greater in high school students (0.60 points) compared to preservice teachers (0.25 points). The plausibility shift towards the scientific model for MF pcMEL had a small effect size compared to the OR baMEL.

Session L 2

25 August 2021 09:00 - 10:00

Session Room 6

Poster Presentation

Assessment and Evaluation, Cognitive Science, Instructional Design, Motivational, Social and Affective Processes

Comprehension of Text and Graphics

Keywords: Assessment Methods and Tools, Cognitive Skills, Comprehension of Text and Graphics, Experimental Studies, Literacy, Motivation, Motivation and Emotion, Primary Education, Reading Comprehension, Secondary Education, Student Learning, Vocational Education

Interest group: SIG 02 - Comprehension of Text and Graphics

Chairperson: Hye Rin Lee, University of California Irvine, United States

An analytic description of ProjectExpert: A reading program for 9th-grade vocational students

Keywords: Comprehension of Text and Graphics, Reading Comprehension, Secondary Education, Vocational Education

Presenting Author:Kim Van Ammel, Ghent University, Belgium; **Co-Author:**Fien De Smedt, Ghent University, Belgium; **Co-Author:**Koen Aesaert, Catholic University of Leuven, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium

A significant amount of 9th-grade students still struggles with proficiently comprehending texts. Moreover, their increasingly lowering motivation to read is alarming. Various educational interventions designed to enhance reading comprehension and/or motivation are available in the scientific field. However, a detailed description of its underlying principles is frequently lacking. This detailed description could provide genuine opportunities for replication, theory building, and dissemination into practice. Therefore, the present study offers an analytical, rigorous, and detailed description of an educational program aimed at fostering 9th-grade vocational students' reading comprehension, strategy use, and autonomous reading motivation, named ProjectExpert. The context, theoretical and/or empirical grounding, macro- and micro-level design principles will be outlined, based on the framework of Bouwer and De Smedt (2018). ProjectExpert entails four micro-level design principles: (1) By means of explicit strategy instruction students are taught to use a repertoire of cognitive and metacognitive reading comprehension strategies. (2) Students practice reading and applying reading strategies in heterogeneous pairs. (3) Text reading is functional. (4) The instruction is embedded in a motivating learning environment, rooted in the fulfilment of students' basic psychological needs (i.e., autonomy, relatedness, and competence). The value of rigorously describing ProjectExpert in light of research, policy, and practice will be discussed.

Development of a progress monitoring tool for upper primary students' reading comprehension

Keywords: Assessment Methods and Tools, Primary Education, Reading Comprehension, Student Learning

Presenting Author:Rielke Bogaert, Ghent University, Belgium; **Co-Author:**Koen Aesaert, KU Leuven (BE), Belgium; **Co-Author:**Emmelien Merchie, Ghent University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium

Within the context of our information society, reading comprehension is a key competence. However, many students experience difficulties with it. This is especially true in upper primary education, which is a critical period in the development of this competence. In this respect, the reading literature increasingly emphasizes the importance of monitoring students' progress in reading comprehension. However, appropriate measurement instruments to realize this progress monitoring are lacking. In this study, therefore, a new tool was developed to monitor upper primary students' progress in reading comprehension (i.e., RC-PM tool), especially focusing on comprehension of expository texts. The test development process followed a multistep process consisting of a) defining the construct of reading comprehension, b) creating and operationalizing a test framework, c) developing the test items and texts, and d) reviewing the quality of the reading comprehension tests. 3269 students participated in the development of the tool. Automated test assembly was conducted in R to compile six equivalent test versions. The theoretical and educational significance of the RC-PM tool is discussed.

THE CONTRIBUTION OF PROSODY IN ORAL COMPREHENSION IN THE FRAMEWORK OF SIMPLE VIEW OF READING

Keywords: Cognitive Skills, Primary Education, Reading Comprehension, Student Learning

Presenting Author:NATALIA CALVO BLÁZQUEZ, Universidad de Salamanca, Spain; **Co-Author:**JOSÉ RICARDO GARCÍA PÉREZ, Universidad de Salamanca, Spain; **Co-Author:**Emilio Sánchez, Facultad de Psicología, Spain

One of the most supported theoretical models explaining reading is "The Simple View of Reading" (Gough & Tunmer, 1986) which maintains that reading comprehension is based in decoding and oral comprehension. One prediction of this model is that the performance in oral and reading comprehension of a person will be equal after reaching certain developmental point of decoding ability. Our research tries to determine in which moment is able to understand in a

similar way a written and a listened story. We have evaluated 1st grade students. Each student listened to a narrative text read by the evaluator and read aloud another one in their own. After the presentation of each text, participants answered orally some questions that allowed us contrasting the performance of each type of comprehension. Two texts and their condition were counterbalance. The rate and the accuracy reading words and pseudowords were controlled. Every student listened to the text with the adequate rhythm and intonation, but, in addition, half of the students listened to the story highlighting though the prosody the different parts of the story and the feelings of the characters. The results showed that the second text was more difficult than the first one. For this text and for poor decoders, also oral comprehension was better than written comprehension when the text was read by the evaluator with a good prosody. In the easier text, oral and reading comprehension were equally for all participants no matter the way in which the texts were orally presented.

Multiple-text task-oriented reading in 4th and 6th graders: comprehension vs selection skill

Keywords: Comprehension of Text and Graphics, Literacy, Primary Education, Reading Comprehension

Presenting Author:Ruth Villalon, University of Cantabria, Spain; **Co-Author:**Hector Garcia-Rodicio, University of Cantabria, Spain; **Co-Author:**Ma. Angeles Melero Zabal, Universidad de Cantabria, Spain; **Co-Author:**Maria Belen Izquierdo, Universidad de Cantabria, Spain

Multiple-text task-oriented reading requires readers not only to comprehend text segments but also to select and integrate relevant information that is distributed across different texts. We explored comprehension and selection skills in primary school students. We asked 146 fourth and sixth graders to read three texts about an exotic country in the Pacific Ocean for the goal of learning the problems that its population is facing. The texts contained 12 relevant and 12 irrelevant concepts. After reading the texts the students took a recall test, in which they revealed how much of the relevant information they recalled, and a verification test, in which they revealed their comprehension of the information presented by the texts, either relevant or irrelevant. Both fourth and sixth graders did well in the verification test but somewhat poorly in the recall test. This means there is room for improvement in selecting even in sixth grade.

Role-Taking in Literary Text Reception and its Relation to Reading Attitudes and Text Comprehension

Keywords: Assessment Methods and Tools, Comprehension of Text and Graphics, Literacy, Motivation and Emotion

Presenting Author:Nora Heyne, Otto-Friedrich-University Bamberg, Germany; **Co-Author:**Maximilian Pfost, University of Bamberg, Germany; **Co-Author:**Hanna Heiler, Otto-Friedrich-Universität Bamberg, Germany

Aim of the study is to investigate open questions concerning the state of abilities of primary school-age children in role-taking while understanding literary texts (empathic text comprehension), and their relations to reading attitudes and text comprehension. These features were assessed by means of tests and questionnaires within readings. Results revealed substantial abilities of children ($N = 160$), in particular of girls, in empathic text comprehension that is correlated with reading attitudes and text comprehension. Data do not indicate effects of these capabilities on text comprehension, mediated by reading attitudes. By taking role-taking into account, the study offers a new methodological approach for the assessment of text comprehension. Future investigation of these abilities while reading promises insights on potentials of empathic reading in order to foster reading competence and further education outcomes.

Influence of the gender asterisk ("Gendersternchen") on comprehensibility and interest

Keywords: Comprehension of Text and Graphics, Experimental Studies, Motivation, Motivation and Emotion

Presenting Author:Marcus Friedrich, Technische Universität Braunschweig, Germany; **Co-Author:**Elke Heise, Institut für Pädagogische Psychologie, TU Braunschweig, Germany; **Co-Author:**Veronika Drößler, Institut für Pädagogische Psychologie, TU Braunschweig, Germany

Since the 1970s, there has been debate on how gender should be represented in language. Recently, the gender asterisk ("Gendersternchen") is becoming more widespread in grammatical gender languages in order to represent all genders. Such gender-fair language is intended to help address the non-male genders more strongly and make their interests and achievements more visible. Based on self-categorization theory, it can be assumed that gender-fair language helps to appeal more to women and other genders and to increase interest in the subjects described in the text. Yet, critics often argue that the use of gender-fair language would make texts less comprehensible. The present experiment for the first time examines the effects of the gender asterisk on text comprehensibility and interest. $N = 159$ participants were randomly given either a board game instruction with masculine-only forms or the gender asterisk. After reading the text, all subjects completed questionnaires on text comprehensibility and interest in the game. As expected, participants who had read the text with the gender asterisk gave higher scores for interest in the game than individuals who had read the text with masculine-only forms by $d = 0.29$. Contrary to expectations, the text using the gender asterisk was found to be rather more comprehensible ($d = 0.38$) than the text with masculine-only forms. The results should be replicated using other text and person populations.

Session L 3

25 August 2021 09:00 - 10:00

Session Room 2

Poster Presentation

Learning and Instructional Technology, Learning and Special Education, Teaching and Teacher Education

Reading Comprehension

Keywords: Assessment Methods and Tools, Attitudes and Beliefs, Competencies, Content Analysis, Cooperative/Collaborative Learning, E-Learning/Online Learning, Educational Technology, Experimental Studies, Higher Education, Language (Foreign and Second), Literacy, Motivation, Neuroscience, Quantitative Methods, Reading Comprehension, Special Education, Teacher Professional Development, Teaching/Instruction

Interest group:SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education, SIG 18 - Educational Effectiveness and Improvement, SIG 22 - Neuroscience and Education

Chairperson: Debra Myhill, University of Exeter, United Kingdom

Piloting a digital learning environment for differentiated reading materials in diverse classrooms

Keywords: Cooperative/Collaborative Learning, E-Learning/Online Learning, Reading Comprehension, Special Education

Presenting Author:Lisa Paleczek, University of Graz, Austria; **Co-Author:**Daniela Ender, Private University College of Teacher Education Diocese of Graz-Seckau, Austria; **Co-Author:**David Wohlhart, Private University College of Teacher Education Diocese of Graz-Seckau, Austria; **Co-Author:**Susanne Seifert, University of Graz, Austria; **Co-Author:**Jessica Berger, University of Graz, Institute of Education Research and Teacher Education, Austria; **Co-Author:**Katharina Prinz, University of Graz, Institute of Education Research and Teacher Education, Austria

Acquisition of knowledge frequently relies on reading comprehension skills. In an inclusive classroom, however, all students should be given the chance to participate in the lesson regardless of their reading level or their first language. We are developing and piloting a digital learning environment that supports teachers to consider the individual learning needs of Grade 4 students. The digital environment offers texts about regional specifics in four different reading levels, a glossary for difficult words as well as reading comprehension and readings strategy tasks. We will analyse the students' (Study 1) and the teachers' handling of the materials. In Study 1, two groups of Grade 4 students (five students each) are working in the digital environment. By using observation sheets and recording the student's impressions through think-aloud protocols as well as interviews, we analyse the learning environment's usability. In Study 2, the adapted learning environment is implemented in an inclusive classroom. Through classroom observation in two lessons and interviews with the teachers and students about their experiences with the implementation, we will find out about the learning environment's feasibility in a whole class setting.

Transmission and transaction beliefs: The factor structure of the German Reader Belief Inventory

Keywords: Assessment Methods and Tools, Attitudes and Beliefs, Higher Education, Reading Comprehension

Presenting Author:Nina Mahlow, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:**Carolin Hahnel, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Ulf Kroehne, DIPF, Germany; **Co-Author:**Cordula Artelt, Leibniz Institute for Educational Trajectories, Germany; **Co-Author:**Frank Goldhammer, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Cornelia Schoor, University of Bamberg, Germany

Beliefs about a reader's role in reading can be subdivided into transmission beliefs, which emphasize understanding the author's intended meaning, and transaction beliefs, which emphasize reader-generated meaning. Previous research has shown that only transaction beliefs relate positively to reading comprehension. These beliefs were often measured with the English-language Reader Belief Inventory (RBI); however, until now there is no German version available. In the present study, 516 university students filled out a German translation of the RBI and worked on a reading comprehension test. Exploratory factor analysis suggested to exclude four items due to low loading and to obtain a simple structure. The cross-validation supported a model with two factors, which were significantly negatively correlated despite the fact that they were uncorrelated in earlier research. Unexpectedly, we found a significant negative correlation between transmission beliefs and reading comprehension, but no relationship between transaction beliefs and reading comprehension.

Improving reading skills in L1 and L2 classes –teachers' opinion on Hungarian reading instruction

Keywords: Content Analysis, Language (Foreign and Second), Reading Comprehension, Teaching/Instruction

Presenting Author:Blanka Tary, University of Szeged, Doctoral School of Education, Hungary

While the need for proficient reading comprehension in L1 and L2 is clear, it seems that there is still room for improvement in these areas. International assessments and research show unsettling or alarming results in many countries, including Hungary. While teachers' beliefs are intensely researched internationally, there seems to be scarce information on their perception of reading instruction in general in both L1 and L2. Thus the aim of this study is to explore teachers' perception about (1) how they evaluate reading instruction in L1 and L2 classrooms in Hungary and (2) whether teachers' L2 proficiency affects their perceptions. Data were gathered anonymously, on-line, with a self-developed questionnaire. 326 Hungarian teachers and teacher trainees responded to two open-ended questions, which asked respondents how they would describe reading instruction in L1 and L2 classes. In discussing reading instruction in L1 and L2, respondents mostly referred to teachers' responsibility, and the teaching methods used. They seemed divided on whether reading instruction is neglected or successful. The findings of this study can inform pre- and in-service teacher training programs.

Does L2 proficiency make a difference when Hungarian teachers read in L1 and L2?

Keywords: Language (Foreign and Second), Quantitative Methods, Reading Comprehension, Teacher Professional Development

Presenting Author:Blanka Tary, University of Szeged, Doctoral School of Education, Hungary

Teachers' reading habit is an important contributing factor not only in teachers' own reading and professional development (Cho & Krashen, 2019) but it affects their students' reading as well (Reichenberg & Andreassen, 2018). Information about pre-service teachers' reading can be found, however in-service teachers are less likely to be included in research of reading habits (Locher & Pfost, 2020). To the author's knowledge there is no Hungarian investigation in this topic or international study that would investigate L1 and L2 reading habits at the same time. Thus the aim of the present study is to provide data about Hungarian teachers' reading habits in L1 and L2. Furthermore, it draws conclusions about whether L2 proficiency impacts reading habits in L1 and L2. There were 326 teachers included in the study using a self-developed questionnaire, where respondents were asked how often they read 4 text types in L1 and L2. Results show that teachers favour shorter texts both in L1 and L2 connected to communication and acquiring facts about the world. It was also found that those with higher L2 proficiency were more likely to read about the latter in L2 rather than in L1. L2 proficiency did not produce significant difference in reading in L1, but it did contribute to different reading habits in L2. The gained information enriches the existing knowledge base about teachers and provides data about Hungarian teachers. The present research might also function as background information for more sophisticated topics such as reading strategies.

Do students pay attention to texts on screens as in print? An EEG study

Keywords: Educational Technology, Experimental Studies, Neuroscience, Reading Comprehension

Presenting Author:Pablo Delgado, University of Valencia, Spain; **Co-Author:**Ladislao Salmeron, University of Valencia, Spain; **Co-Author:**Lidia Altamura, University of Valencia, Spain; **Co-Author:**Marta Vergara-Martínez, University of Valencia, Spain

A recent meta-analysis revealed significant lower comprehension outcomes of on-screen reading, as compared to in-print reading, and also suggested that this effect especially arises when the reading task demands high level of cognitive effort. Lessened sustained attention to texts on screen is suggested as one of the causes, but there is a lack of studies addressing online attention while reading in different media. Thus, the present ongoing investigation consists of a comparison of EEG attentional activity between reading on screen and in print. In addition, the interaction between the medium effect and the cognitive demands of the reading task is examined by manipulating the texts difficulty. Forty-one undergraduates have been already participated in a within-participant 2-by-2 experimental study that asked them to read four expository texts varying on difficulty (low vs. high coherence) and medium (printed booklet vs. computer screen). We measured participants' EEG activity and eye-movements while reading in addition to their text comprehension outcomes. To control for confounders, participants' reading comprehension skill, sustained attention capacity, short-term verbal memory, prior knowledge, situational interest, and multitasking habits were assessed. Desynchronization of EEG alpha and beta bands will be analysed as correlates of attentional engagement. We expect lower alpha/beta desynchronization during on-screen reading as an indicator of lessened attentional efforts in this medium, as compared to reading in print, an effect that will be more salient for the difficult texts. Thus, comprehension outcomes will be lower when reading difficult texts on screen. Results and conclusions will be presented at EARLI 2021.

Effects of score-based and log data-based feedback in a test of multiple document comprehension

Keywords: Competencies, Literacy, Motivation, Reading Comprehension

Presenting Author:Theresa Zink, Otto-Friedrich-Universität Bamberg, Germany; **Co-Author:**Carolin Hahnel, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Ulf Kroehne, DIPF, Germany; **Co-Author:**Tobias Deribo, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Nina Mahlow, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:**Cordula Artelt, Leibniz Institute for Educational Trajectories, Germany; **Co-Author:**Frank Goldhammer, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Johannes Naumann, Bergische Universität Wuppertal, Germany; **Co-Author:**Cornelia Schoor, University of Bamberg, Germany

Multiple document comprehension (MDC) is an important competence for university students since they are confronted with text documents from several sources (Schoor et al., 2020). As with the development of other competencies, elaborate feedback can be beneficial for the learners' motivation (Rakoczy et al., 2008). Process indicators derived from log data in technology-based assessments of competencies can be used to give students elaborate feedback based on their test-taking behavior in contrast to feedback based on shown performance. We presume that feedback only has an effect on motivation to improve MDC-competence if feedback is accepted and perceived as useful. Therefore, this study aims to examine differences in feedback perception of different feedback types and their effects on motivation using two experimental groups: performance score-based only and score-based plus log-data-based feedback. Moreover, it will be investigated whether there is a discrepancy between the received feedback and MDC-related self-concept that influences feedback perception and motivation. It is expected that 300 first-semester students will have participated in an MDC-test by end of March 2021 which was conducted as a self-assessment test, integrated in a web-based learning-platform. Data analysis focuses on regression models including interaction effects. We expect that students who perceive feedback positively will benefit motivationally, especially those who receive log data-based feedback. With regard to the discrepancy between feedback and MDC-self-concept, it is expected that a low discrepancy leads to a more positive feedback perception and a higher motivation. However, students with a higher discrepancy could benefit motivationally of accepted log data-based feedback.

Session L 4

25 August 2021 09:00 - 10:00

Session Room 12

Poster Presentation

Cognitive Science, Learning and Instructional Technology, Teaching and Teacher Education

Science Education

Keywords: Argumentation, Citizenship Education, Comprehension of Text and Graphics, Computer-supported Collaborative Learning, Conversation/Discourse

Analysis, Educational Psychology, Educational Technology, Engineering, Informal Learning, Inquiry Learning, Literacy, Mathematics, Meta-analysis, Motivation, Science Education, Teacher Professional Development, Teaching/Instruction, Technology, Video Analysis

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education, SIG 17 - Methods in Learning Research, SIG 20 - Inquiry Learning, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Uwe Maier, University of Education Schwäbisch Gmünd, Germany

Knowledge For Everyone: Translating Psychological Evidence Into Plain Language

Keywords: Citizenship Education, Comprehension of Text and Graphics, Meta-analysis, Science Education

Presenting Author: Martin Kerwer, Leibniz Institute for Psychology (ZPID), Germany; **Co-Author:** Marlene Stoll, Leibniz Institute for Psychology (ZPID), Leibniz Institute for Resilience Research (LIR), Germany; **Co-Author:** Anita Chasiotis, Leibniz Institute for Psychology (ZPID), Germany; **Co-Author:** Klaus Lieb, Leibniz Institute for Resilience Research (LIR), Germany; **Co-Author:** Michael Bosnjak, Leibniz Institute for Psychology (ZPID), Germany

How can we enable citizens to make informed decisions in everyday life? The open science movement aims to make research outputs accessible to everyone by enhancing the transparency of scientific methods and findings. However, in most cases, scientific evidence is not communicated in a way that laypersons (i.e., non-scientists) can understand. This constitutes a barrier which considerably diminishes the accessibility and usability of published research findings for lay audiences. Plain language summaries (PLS) aim to address this problem by providing easily comprehensible research summaries that complement scientific abstracts.

First, we outline results of a systematic review that identified a lack of evidence on how to optimally communicate meta-analytic (psychological) findings to laypersons via PLS. We then present a research project ('PLan Psy') which aims at developing evidence-based guidelines on how to write PLS for psychological meta-analyses. This will be done by conducting experimental studies in which characteristics (e.g., structure, presentation of statistics) of PLS will be systematically varied with respect to relevant outcomes (e.g., comprehensibility, decision making). From the insights gained, guidelines for writing PLS will be derived and suitable training materials for PLS authors will be developed and evaluated through target group surveys.

The presented research addresses an important gap in the current research communication and open science landscape by providing evidence-based guidelines for making psychological research accessible to laypersons. Thus, our project supports the development of a citizen-oriented science that is not only transparent but also understandable, thereby contributing to a well-informed and empowered society.

Productive and argumentative discussions in science in Chile: practices, needs, and challenges

Keywords: Argumentation, Science Education, Teacher Professional Development, Teaching/Instruction

Presenting Author: Florencia Gomez Zaccarelli, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Natalia Candido Vendrasco, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Belén Hernández, Pontificia Universidad Católica de Chile, Chile

Although the Chilean curriculum comprises science education, science discussions and argumentation in classrooms are a recent addition. Moreover, research findings show that opportunities to develop discussions in elementary classrooms are rare and teaching features Interrogation-Response-Evaluation type of interactions with limited participation from students. This pattern does not allow the development of argumentation in the classroom in the context of scientific discussions. Therefore, knowing what might facilitate productive and argumentative discussions in science classrooms is of great importance. Likewise, it is imperative to know how Chilean teachers might facilitate these interactions and the needs and challenges they face. This study describes the facilitation practices identified through a systematic literature review and expert teachers' perceptions in in-depth interviews. Preliminary analyses show that practices to facilitate science discussions have dialogic/interactive purposes, grant roles to teachers and students, and specify participation structures, discourses, and particular teaching practices. The empirical studies reviewed identify challenges to the facilitation of science discussions and argumentation at different levels. Curriculum, student diversity, and class size influence challenges at the institutional level, and teachers' pedagogical content knowledge, their epistemic beliefs, and their stance towards dialogic teaching influence challenges at the individual level. Teachers' perceptions around discussion and argumentation practices show that they have seldom implemented them even though they know these practices. These findings might illuminate our understanding of how teachers might support students to engage in science discussions and argumentation practices in the particular context of Chilean elementary science classrooms.

Scaffolding Collaborative Discourse and Modeling Practices

Keywords: Computer-supported Collaborative Learning, Conversation/Discourse Analysis, Science Education, Video Analysis

Presenting Author: Yinuo Hu, University of North Carolina at Chapel Hill, United States; **Presenting Author:** Yujin Tao, University of North Carolina at Chapel Hill, United States; **Co-Author:** Kihyun "Kelly" Ryoo, University of North Carolina at Chapel Hill, United States

Engaging students in modeling practices can help students deepen their understanding of science through discourse-rich practices. This study explores how automated feedback in a modeling tool can scaffold middle school students' collaborative discourse and modeling practices. Analyses of video data from 15 pairs from eighth-grade classrooms revealed that students were prompted by automated feedback to engage in developing, critiquing, and explaining their models. The results also showed specific sequence patterns of student discourse mediated by automated feedback when evaluating and revising their models. The findings of the study suggest the potential value of automated feedback as an effective scaffolding method to support students' modeling practices.

Analysing science, technology, engineering and mathematics (STEM) field with topic modelling

Keywords: Engineering, Mathematics, Science Education, Technology

Presenting Author: Ari Tuukkala, University of Jyväskylä, Finland; **Co-Author:** Catalina Espinoza, University of Chile, Chile; **Co-Author:** Raija Hämäläinen, University of Jyväskylä, Finland; **Co-Author:** Tommi Kärkkäinen, University of Jyväskylä, Finland; **Co-Author:** Joni Lämsä, University of Jyväskylä, Finland; **Co-Author:** Matias Mäki-Kuutti, University of Jyväskylä, Finland

The research field of science, technology, engineering and mathematics (STEM) has evolved since 1990s when the United States National Science Foundation introduced these subjects as an integrated combination for undergraduate and K-12 school education. Recent studies have aimed to identify what research topics the field addresses by manually analysing published articles in STEM-related journals. In this study, we apply machine-learning methods, instead of mere human interpretation, to analyse a comprehensive collection of STEM journal articles. We used a natural language processing method called topic modeling to analyse 798 journal publication abstracts, to explore a suitable amount of topic models and to examine what the topics contain. By conducting this study, we demonstrate the applicability of machine learning for educational research purposes.

How do people search for content and source information across knowledge domains?

Keywords: Educational Psychology, Informal Learning, Literacy, Science Education

Presenting Author: Holger Futterlein, University Erfurt, Germany; **Co-Author:** Leonie Aßmann, University Erfurt, Germany; **Co-Author:** Eva Thomm, University of Erfurt, Germany; **Co-Author:** Tilmann Betsch, University Erfurt, Germany; **Co-Author:** Johannes Bauer, University of Erfurt, Germany

Today people increasingly have to handle science-based information and weigh competing claims to reach informed decisions. Evaluating such information, they can engage in evaluations of either the contents (e.g., based on their knowledge) or the trustworthiness of source providing the information (e.g. based on the source's expertise). The present study explored in which ways individuals search for content and source information when reasoning about multiple topics across two different knowledge domains (health, education). Twenty-nine undergraduate students participated in the study. To scrutinize participants' information seeking we employed information boards, a method commonly used by research on decision making. Each board presented a question defining the purpose of the information search and presented four information sources. For each source, participants could opt for information about the sources' expertise and interests; and about the contents they provided. Detailed information was covered on cards, so that participants had to actively select and turn them. The results showed that participants preferably started their information search with information on source expertise, though they uncovered information on both source characteristics and contents. There were no differences across topics of both domains. The results indicate that participants evaluated trustworthy sources first before dealing with content information. **Keywords:** sourcing, information seeking, health, education

Task perception, task performance, and learning outcomes in simulation-based inquiry learning

Keywords: Educational Technology, Inquiry Learning, Motivation, Science Education

Presenting Author:Tomi Jaakkola, Tampere University, Finland; **Co-Author:**Koen Veermans, University of Turku, Finland

The positive effects of computer-simulations on learning outcomes are clearly demonstrated in the literature. The literature also emphasizes the importance of guidance and support in relation to learning outcomes from simulations. However, it is less well understood how situational factors during learning with simulations are connected to each other and how they might mediate the learning outcomes. To this end, the present study investigates how students' task perception (interest in the task and perceived task difficulty) and task performance (quality and fluency of learning) in a simulation are connected to learning outcomes and how these factors interact with each other while students carry out experiments in the simulation. Participants of the study were 115 upper elementary school students. The data has been collected and is currently being coded. Analyses will start once the coding has been finished, and the outcomes relating to the research questions will be presented at the conference. The results of the study can provide more detailed information on how different situational variables relate to the learning outcomes obtained from simulations and they help us to better understand the learning processes that take place in a simulation environment.

Session L 5

25 August 2021 09:00 - 10:00

Session Room 5

Poster Presentation

Higher Education, Teaching and Teacher Education

Attitudes and Beliefs

Keywords: Attitudes and Beliefs, Conversation/Discourse Analysis, Design-based Research, E-Learning/Online Learning, Higher Education, Instructional Design, Mathematics, Quasi-experimental Research, Special Education, Survey Research, Teacher Professional Development, Teaching Approaches, Teaching/Instruction, Video Analysis, Workplace Learning

Interest group: SIG 11 - Teaching and Teacher Education, SIG 17 - Methods in Learning Research, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: MArk WHite, University of Oslo, Norway

Promoting and supporting future teachers' attitudes towards inclusion through an e-learning module

Keywords: Attitudes and Beliefs, E-Learning/Online Learning, Special Education, Teacher Professional Development

Presenting Author:Daria Ferencik-Lehmkuhl, University of Cologne, Germany; **Co-Author:**Ilham Huynh, University of Cologne, Germany; **Co-Author:**Vanessa Heuser, University of Cologne, Germany; **Co-Author:**Aryana Samawaki, University of Cologne, Germany

Our society is currently changing rapidly in all areas. This also applies to the education system in Germany. In this context, teachers have a great responsibility in shaping the future of their students. In this regard teachers of all types of schools face a variety of challenges. This is especially true for challenges related to diversity and inclusion.

In the project "Future Strategy for Teacher Education", one of the working teams deals with Inclusive Education. One of its aims is to help future teachers reflect on their attitudes towards inclusion. In this context, the e-learning module "An Introduction to Inclusion" was designed to support inclusion-oriented and digital teaching. Within the evaluation of the module (N= 36), one of the questions asked was whether the module was generally suitable for improving student teacher's attitudes towards inclusion. The question of whether the blended learning format offers additional advantages was of particular interest. The poster presents the first results of this evaluation.

"HERO" – Effects of an attributional retraining program

Keywords: Attitudes and Beliefs, Higher Education, Instructional Design, Quasi-experimental Research

Presenting Author:Daniel Schropp, Ulm University, Germany; **Co-Author:**Lisa Respondek, Ulm University, Germany; **Co-Author:**Tina Seufert, Ulm University, Germany

Perceived academic control (PAC) seems to be a decisive factor for students' academic success, especially for university freshman. Attributional retraining (AR) programs offer an intervention possibility to foster students' academic believes. In our study, we implemented an AR training based on Parker et al. (2018) with students from different subject areas in their first semester who were visiting a lecture, which requires a midterm exam. In a quasi-experimental trial with pre- and post-test as well as a follow-up measurement we analyzed the trainings effect on learners' self-efficacy, their PAC, their study performance, dropout intention and their study satisfaction depending on whether they participated either more successfully or more intensively in the training. The training had a significant positive effect on dropout intention when learners engaged intensively in the training. All the other parameters were affected positively but not significantly, not even when learners participated more intensively in the training.

Facilitating Teacher Learning about Classroom Discourse: The Role of Constructivist Beliefs

Keywords: Attitudes and Beliefs, Teacher Professional Development, Teaching Approaches, Video Analysis

Presenting Author:Dennis Hauk, Friedrich-Schiller-University of Jena, Germany; **Co-Author:**Alexander Goeschner, Friedrich Schiller University Jena, Germany; **Co-Author:**Martina Alles, Technische Universität München (TUM), Germany; **Co-Author:**Maralena Weil, Technical University of Munich, Germany; **Co-Author:**Ricardo Böheim, University of Augsburg, Germany; **Co-Author:**Ann-Kathrin Schindler, Technische Universität München, Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany

This presentation investigates the effects of teacher professional development (TPD) on teacher knowledge about classroom discourse and constructivist beliefs. In a one-year intervention study, participating teachers were assigned either to an adaptive-to-practice programme or a specified instructional programme with two different facilitation approaches. The workshops in both TPD programs were filmed and analysed. Furthermore, changes in teacher knowledge and beliefs were measured in a pre- and posttest. Results show that facilitation in the adaptive-to-practice approach supported a significant change in teachers' beliefs. No differences over time were found in teacher knowledge. The findings are discussed in light of the design principles for TPD and ways of sustainable and scalable facilitation.

The promise and challenges of peer facilitation to support teacher learning about dialogic teaching

Keywords: Mathematics, Teacher Professional Development, Teaching Approaches, Workplace Learning

Presenting Author:Elisa Calcagni, Friedrich Schiller University Jena, Germany

This paper focuses on the role of facilitators in a professional development [PD] programme designed by a researcher but run locally by teacher-facilitators. The aim of the study was promoting better-quality classroom dialogue that is characterised by constructive and critical engagement. While PD programmes on the topic abound, they tend to be single-site, researcher-run initiatives with limited replicability and scalability. Facilitation, usually researcher-led, remains understudied. This research aimed to generate a more scalable design through lower costs and reliance on local facilitation. It was implemented in three schools (two completing the programme and one that dropped out) and participants in finishing schools progressed in their observation skills and dialogic practices in mathematics. Data presented here consists of 15 interviews with participating teachers, school leaders and peer-facilitators and videos from 15 PD sessions. The analysis explored questions of feasibility and characteristics of peer facilitation. Results show that in the two schools that completed the programme, feasibility was increased by high commitment and ownership with the role alongside support and pressure from the school leadership and/or researchers. Facilitators' role was characterised as comprising sustaining the programme, preparing sessions and delivering them. The session videos mirrored participants' characterisation of facilitators' guidance. Important aspects were the mediation of conversations (where inviting and accepting were more prominent than challenging), the promotion of a safe participation environment, and the involvement of facilitators as learners themselves. Peer facilitation appears thus to differ from expert facilitation in some aspects and coincide in others, making further exploration necessary.

Local facilitation of practitioner-led inquiry into classroom dialogue using a research-based tool

Keywords: Conversation/Discourse Analysis, Design-based Research, Teacher Professional Development, Teaching/Instruction

Presenting Author:Sara Hennessy, University of Cambridge, United Kingdom; **Co-Author:**Ruth Kershner, University of Cambridge, United Kingdom; **Co-Author:**Elisa Calcagni, Friedrich Schiller University Jena, Germany; **Co-Author:**Farah Ahmed, University of Cambridge, England, United Kingdom

Research indicating the educational value of classroom dialogue, in which participants engage critically and constructively with other perspectives, is long-established but classroom practice evolves slowly. Outcomes of practitioner professional development in this area are inconsistent and not necessarily sustained or scaled, without opportunities for practitioner leadership, and often dependent on costly external input. A resource pack was designed to support iterative cycles of practitioner inquiry based on systematic analysis of classroom dialogue and reflecting critically with peers. This openly-available resource embeds research findings about forms of dialogue that are productive for student learning. We report our design-based research comprising nested inquiry cycles involving 74 practitioners from early years to higher education levels. Participants used and adapted the resources for their own goals, needs and diverse contexts across six countries. Typically, local facilitators worked to support groups of practitioners. Data were derived from pre- and post-surveys, inquiry reports, and facilitator and participant interviews, employing descriptive statistics and thematic analysis. Findings illuminate models of institutional organisation of inquiry and facilitation, and supporting and constraining factors underlying facilitation and engagement. We discuss design principles for scalability and sustainability based on a non-prescriptive model of local ownership and facilitation of self-directed practitioner inquiry and purpose-driven adaptation in complex educational circumstances. This promotes understanding of how systematic inquiry and knowledge mobilisation can be supported with light-touch external input, guided by research-informed material resources developed iteratively with practitioner input.

Q Methodology: Assessing subjectivities in teacher education through structured ranking of items

Keywords: Attitudes and Beliefs, Survey Research, Teacher Professional Development, Workplace Learning

Presenting Author:Susann Julia Leidig, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Hanna Köhler, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Carina Caruso, University of Paderborn, Germany; **Co-Author:**Michael Goller, Friedrich Schiller University Jena, Germany

Q methodology is an exploratory method to elicit discrete patterns of subjectivities (e.g., beliefs) using a semi-quantitative approach. It aims to identify homogeneous latent clusters of viewpoints towards a certain topic from a larger more heterogeneous set of (a priori unknown) different viewpoints held by respondents in the population. Although its long tradition, this method has not been widely used in educational research. The fact that the method is relatively unknown in educational research is surprising, because it aims to evoke discrete patterns of subjectivity. Such subjectivities are of great importance in educational research because they influence educational processes. This poster therefore aims to introduce Q methodology to a larger audience. This will be done by explaining it on a conceptual level first. The method will then be illustrated with a small study that focuses on student teachers in the context of their five-month school internship. The participants are asked to rank qualitative statements in regard to their internship according to their agreement or disagreement into a ranking grid. Using factor analysis, the collected individual viewpoints are then summarised and reduced resulting in a distinct set of perceptions on the topic (i.e., clusters of expectations). The following research question is answered: What expectations do teacher students have concerning their internship and their own role in this internship? However, the main focus of this contribution lies on the discussion of benefits and challenges associated with using the method in the context of educational research.

Session L 6

25 August 2021 09:00 - 10:00

Session Room 7

Poster Presentation

Cognitive Science, Higher Education, Learning and Social Interaction, Learning and Special Education

Student Learning and Peer Interaction

Keywords: Achievement, At-risk Students, Cognitive Development, Communities of Learners, Competencies, Emotion and Affect, Higher Education, Learning and Developmental Difficulties, Parental Involvement in Learning, Peer Interaction, Quantitative Methods, Quasi-experimental Research, Science Education, Secondary Education, Social Development, Social Sciences, Student Learning, Vocational Education

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 15 - Special Educational Needs, SIG 22 - Neuroscience and Education, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Hsin-Yi Chang, National Taiwan Normal University, Taiwan

A phenomenological study of adolescent thinking in dialogue about literary texts

Keywords: Communities of Learners, Peer Interaction, Secondary Education, Social Development

Presenting Author:Sadia Shafquat, University of Cambridge, UK, United Kingdom

This study considers questions of how the adolescent experience of talking together about literary texts might relate to thinking dialogically. It explores the contours of dialogue between adolescents in a literature classroom, and the nature of thinking which take place through these classroom encounters. The field of dialogic education has grown significantly in the 21st century and there has emerged a sizeable body of evidence-based research linking dialogue-based practices in classrooms to the development of children's thinking. However, most of this research has taken place with young children in primary school settings. There has been an identified need to explore the place of dialogic methods of learning and instruction within existing secondary school curriculums. This study sought to bring adolescent experience to the fore to consider the value of dialogic methods to students as they learn to think about self, other and community. Data collected in this study consisted of recorded phenomenological interviews with five 14-15 year olds, as well as recordings of classroom dialogue between those participants and others. This study is currently in the latter stages of data analysis, with initial findings indicating that adolescents' encounters with difference and unfamiliarity is an opening to relational thinking. Preliminary analysis suggests that thinking takes place first as a dialogue with an abstract-imaginary other, and that in meeting the real other in talk, the adolescent self is energised and strengthened through the oscillations of dialogue. Thinking is then experienced as fruition.

How preterm birth and social burdens of the family are affecting on children's executive functions?

Keywords: At-risk Students, Cognitive Development, Learning and Developmental Difficulties, Parental Involvement in Learning

Presenting Author:Minna Törmänen, University of Teacher Education in Special Needs Zurich, Switzerland; University of Helsinki, Finland, Switzerland; **Co-Author:**Simone Schaub, University of Applied Sciences of Special Needs Education, Switzerland; **Co-Author:**Erich Ramseier, PH Bern, University of Teacher Education, Switzerland; **Co-Author:**Andrea Lanfranchi, University of Applied Sciences of Special Needs Education, Switzerland; **Co-Author:**Alex Neuhauser, University of Applied Sciences of Special Needs Education, Switzerland

There is an importance of understanding how premature birth and social burdens of the family might interact cognitive development and form a risk for neurodevelopment delays of the child. The aim of this longitudinal study is to describe cognitive development and executive functions (EF) of preterm and early term children (N=89) during their first three years in families which have social burdens, like social, financial and/or psychological risk factors. The other aim is to study intervention effects when Parents as Teachers program is used. Participants are withdrawn from ZEPPELIN 0-3 research project which is a longitudinal intervention study (N=248 families with 261 children) conducted in Switzerland. It aims to study whether early support during first three years has positive impacts on children's development and parents show improved parenting practices in families with social burdens. In ZEPPELIN 0-3 four comprehensive developmental assessments are conducted during the first three years of the child. Generally, there is a lack of EF measurements for toddlers and situation is even more complicated with preterm children. This study will use EF components from Bayley Scales of Infant and Toddler Development (BSID-III, 2005). In addition, maternal questionnaire of emotional and behavioral problems, Child Behavior Check List will be used. The study is

retrospective, and the analyses will be conducted during spring 2021. The educational significance of this study emphasizes the prevalence of preterm and early term children and the need of studies on early interventions which support developmental trajectories and environmental factors.

The Relation of Representational Competence and Conceptual Knowledge about Electromagnetism

Keywords: Achievement, Quantitative Methods, Science Education, Student Learning

Presenting Author:Sarah Malone, Saarland University, Germany; **Co-Author:**Peter Edelsbrunner, ETH Zurich, Switzerland; **Co-Author:**Andreas Lichtenberger, ETH Zurich, Switzerland; **Co-Author:**Stefan Küchemann, TU Kaiserslautern, Germany; **Co-Author:**Jochen Kuhn, TU Kaiserslautern, Physics Education Research Group, Germany; **Co-Author:**Andreas Vaterlaus, ETH Zurich, Switzerland; **Co-Author:**Elsbeth Stern, ETH Zurich, Switzerland; **Co-Author:**Roman Schmid, ETH Zurich, Switzerland; **Co-Author:**Ralph Schumacher, ETH Zurich, Switzerland; **Co-Author:**Kristin Altmeier, Saarland University, Germany; **Co-Author:**Roland Bruenken, Saarland University, Germany

Physics education includes the use of different types of external representations, which depict or describe the complex physical concepts to be acquired. However, the interpretation of disciplinary representations (e.g., graphs) places considerable requirements on the learners' representational competence. Aiming at exploring the relation of representational competence and conceptual knowledge, we conducted a study with 515 students who took a context-free representational competence test of vector fields and field line representations and a conceptual knowledge test on electromagnetism. According to the Pearson correlation estimate of students' scores on the two measures ($r = .53, p < .001$), as well as the estimate of the latent correlation between the two constructs ($r = .68, p < .001$), and the results of a confirmatory factor analysis, the relation of representational competence and conceptual knowledge can be described as linear-positive, whereas the two constructs are nevertheless distinguishable factors. Moreover, graphical data analysis indicated that whereas there were some students with high representational competence but low conceptual knowledge, there were no students with low representational competence but high conceptual knowledge. This result supports the assumption that representational competence is a prerequisite for conceptual knowledge. Teachers should therefore explicitly seek to build sufficient representational competence in their students in order to best prepare them for the acquisition of a new scientific concept.

The Effect of Standing versus Sitting on Creativity in Vocational Education and Training Students

Keywords: Quantitative Methods, Social Sciences, Student Learning, Vocational Education

Presenting Author:Petra Luteijn, Open University of the Netherlands, Netherlands; **Co-Author:**Inge van der Wurff, Open University of the Netherlands, Netherlands; **Co-Author:**Amika Singh, Mulier Institute, Netherlands; **Co-Author:**Hans Savelberg, Maastricht University, Netherlands; **Co-Author:**Renate de Groot, Open University of the Netherlands, Netherlands

Creativity is increasingly important for success in the labor market. Standing potentially influences creativity as several brain mechanisms are stimulated by light physical activity such as standing. Therefore, our aim is to investigate the effect of standing during class on creativity in vocational education and training (VET) students. In a randomized controlled cross-over study, 192 VET students were assigned to either a sitting or standing condition during 30 minutes. During the last 15 minutes, the students performed the Guilford's Alternate Uses test for divergent thinking and the Remote Associates Test for convergent thinking. Subsequently, the conditions were switched and the procedure was repeated in the same lesson. The data was analyzed using multilevel analyses. No effects of standing on divergent thinking, $B = -0.06, SE_B = 0.22, 95\%CI = -0.49; 0.38$, or convergent thinking, $B = -0.20, SE_B = 0.15, 95\%CI = -0.56; 0.03$ were found. It can be concluded that short-time standing does not affect creativity in VET students. Future studies should investigate the effects of more prolonged or intensive physical activity on creativity.

Dog-Assisted Interventions in Higher Education: A Way to Promote Students' Perceived Well-Being

Keywords: At-risk Students, Emotion and Affect, Higher Education, Quasi-experimental Research

Presenting Author:Cathrin Rothkopf, Universität Regensburg, Germany; **Co-Author:**Silke Schworm, University of Regensburg, Germany

Both, in the transition to university and during it, students experience a multitude of new and different cognitive, social, and environmental challenges. Thus, it is not surprising that many students in higher education report suffering from mental health issues, which in turn also may impact their academic performance. To address these issues, animal-assisted interventions (AAIs) have gained increasing attention in higher education in recent years. Nevertheless, AAIs have not been used at German universities so far. The aim of the present study was to investigate the possible effects of AAIs on German students' psychological and physical well-being. 27 students participated in a dog-assisted intervention (DAI) in which they were allowed to interact with a tested and approved dog for 15 minutes. To obtain information about their psychological and physical well-being, blood pressure was measured, and the Basel Befindlichkeitsskala was completed before and after the intervention. The results of this study provide evidence of a significant improvement in psychological well-being of students in higher education as a result of the DAI, but no significant changes in physical well-being were observed. Consequently, it can be assumed that AAIs in higher education can provide psychological benefits for students and thus may contribute to the help they need.

Stress management and resilience fostering in students' curricula: Implementation of an intervention

Keywords: At-risk Students, Competencies, Higher Education, Student Learning

Presenting Author:Natalie Peters, TU Dresden, Fakultät Wirtschaftswissenschaften, Germany

Promoting health and well-being in students plays an increasingly important role in higher education as workloads increase and general health issues arise. Consequently, academic performance could suffer and might finally lead to student drop-out. Through various implemented strategies, universities are trying to counteract this development. Especially health interventions are to strengthen students' coping with their current environment, as well as to prepare them for the future and the upcoming job market. As these interventions often only include singular aspects of health promotion and are not implemented in students' curricular, this study tested a holistic intervention embedded into a seminar at a large German university. The effectiveness of the intervention is tested by a questionnaire with the variables perceived stress, well-being, resilience and coping strategies. Students complete it at three points in time: Directly before the intervention, directly after and at a six-week follow-up. To test significant differences, a control group answers to the same questionnaire. It is hypothesized that the implementation of the intervention will increase well-being and resilience, lower perceived stress levels and broaden the students' coping strategies. This way, the intervention will contribute in promoting health and well-being among students for the long haul and therefore prepare prospective employees to better navigate in an ever-changing world. Adding to that, this approach could be the foundation for implementing pre-emptive interventions in students' curricula as an integral part of higher education.

Session L 7

25 August 2021 09:00 - 10:00

Session Room 3

Poster Presentation

Assessment and Evaluation, Motivational, Social and Affective Processes, Teaching and Teacher Education

Teaching and Instruction

Keywords: Assessment Methods and Tools, Attitudes and Beliefs, Competencies, Developmental Processes, Educational Technology, Environmental Education, Inquiry Learning, Interdisciplinary, Pre-service Teacher Education, Science Education, Self-efficacy, Survey Research, Teaching Approaches, Teaching/Instruction

Interest group:SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education, SIG 25 - Educational Theory

Chairperson:Sonja Berger, Ludwig-Maximilians-Universität (LMU), Germany

Assessing secondary teachers' gender competencies and stereotypes in physics

Keywords: Attitudes and Beliefs, Competencies, Science Education, Teaching/Instruction

Presenting Author:Sanja Atanasova, Pädagogische Hochschule St. Gallen, Switzerland; **Co-Author:**Nicolas Robin, Fachdidaktik Naturwissenschaften, Switzerland; **Co-Author:**Dorothee Brovelli, Pädagogische Hochschule Luzern, Switzerland

To create gender-sensitive learning environments that foster the development of girls' and boys' interest in physics teachers must have gender competencies (e.g. Bartsch & Wedl, 2015; Lembens & Bartosch, 2012). To that end, teachers require not only knowledge (e.g. on how to promote gender-sensitive teaching), but also the skills to notice and interpret *gender-relevant* factors in classroom situations that are important for their teaching practice and for their students' learning success. This ability is referred to as *professional vision* (van Es & Sherin, 2002) and is considered to be a component of teachers' gender competencies (Brovelli, Vogler & Schmid, 2019).

However, little is known about teachers' gender competencies in physics teaching. To clarify this question, survey instruments are required that can validly capture teachers' knowledge and *professional vision* of *gender-relevant* factors in physics teaching. In this study, a standardized vignette test is developed to investigate teachers' *professional vision* of *gender-relevant* factors in physics teaching. In addition, a knowledge test is used to assess the knowledge of *gender-relevant* factors for physics teaching. Moreover, teachers' gender stereotypes are examined more closely in this context, as it is assumed that they can influence teachers' *professional vision*. The aim of this study is to investigate the structure of teachers' gender competencies in physics teaching by studying the relation of teachers' *professional vision* of *gender-relevant* classroom situations and teachers' knowledge and implicit and explicit gender stereotypes. This poster presentation provides an overview of the research design and presents first results of the pilot study.

Critical Thinking in Norwegian Teacher Education (CT-TED)

Keywords: Attitudes and Beliefs, Interdisciplinary, Pre-service Teacher Education, Teaching/Instruction

Presenting Author:Leila Ferguson, Kristiania University College, Norway; **Co-Author:**Jarmila Bubikova-Moan, Kristiania University College, Norway; **Co-Author:**Magne Skibsted Jensen, Ostfold University College, Norway

Critical thinking (CT) is an essential skill for democratic, healthy citizens of a socially just world. The nature of tomorrow's global problems is uncertain and today's solutions in tackling them are unlikely to be adequate. Our society is therefore dependant on young people that are ready to respond to rapid developments, such as technological advances and changing labour-market demands, by applying CT skills to complex issues. Schools are key platforms where the skills and will to engage in CT should be nurtured, and future teachers are the link between educational policy aims and students' learning. However, we know little about how teachers are being prepared to teach CT to young students. This project addresses the teaching of CT in Norwegian teacher education. Working together with teacher educators, we aim to provide clear definitions of CT, develop effective teaching methods for teacher educators that are based on a combination of research and best-practice, and support preservice teachers' (PSTs') development of skills and will to teach discipline-specific CT to their students. In our poster presentation, we present a planned program of research for constructive critique.

Identifying and Implementing Digital Teaching-Learning-Scenarios in Pre-Service Teacher Education

Keywords: Assessment Methods and Tools, Educational Technology, Pre-service Teacher Education, Teaching/Instruction

Presenting Author:Nadine Schlomske-Bodenstein, Karlsruhe University of Education, Germany; **Presenting Author:**Bernhard Standl, Karlsruhe University of Education, Germany

Identifying digital teaching-learning-scenarios and their impact on learning is of special interest from the pedagogical-psychological point of view. The study in this presentation focuses on the development and validation of an expert-based taxonomy which was developed in order to store, and thus make available, best-practice-examples of digital supported teaching for a wide range of teachers. Secondly, we tested to what degree the taxonomy serves as a conceptual structure for a database, in order to systematically analyze and identify teaching patterns by means of an existing approach from the emerging field of digital humanities. The design, methods, and initial results are presented. Finally, implications of the study for developing innovative teaching-learning-scenarios will be discussed.

Self-efficacy of pre-service teachers on writing instruction in inclusive classrooms

Keywords: Pre-service Teacher Education, Self-efficacy, Survey Research, Teaching/Instruction

Presenting Author:Sandra Schwinding, University of Wuppertal, Germany; **Presenting Author:**Sarah Jagemann, Bergische Universität Wuppertal, Germany

The study examines how pre-service teachers perceive their capability to adapt writing instructions to learners with diverse educational needs. Self-efficacy with regard to teaching writing in L1-German inclusive classrooms has not been researched thus far. We are investigating changes in self-efficacy during the course of university years as well as the dependency on teaching experience and attitudes towards inclusive educational settings. The questionnaire created for this study includes items on process-oriented writing instruction and assessment as well as outlooks on the ability to assess writing skills from written works. In addition, it focuses on the attitudes towards distinct dimensions of heterogeneity, diagnosis of achievements and learning developments, adaptive approaches to teaching writing and cooperative forms of learning. Subjects of this research are student teachers ($n \approx 1000$) across all stages of teacher education programs throughout Germany. Through statistical analysis we aim to explore the dimensionality of the construct "self-efficacy in adaptive teaching of writing" and discover contributing factors (e.g., practical and theoretical experiences, degree program, attitudes). The questionnaire was successfully used in a pilot study in late 2020 ($n = 201$, $\alpha = .78-.96$).

Critical Thinking as a Tool in Education for Sustainable Development

Keywords: Environmental Education, Inquiry Learning, Teaching Approaches, Teaching/Instruction

Presenting Author:Eleni Sinakou, University of Antwerp, Belgium; **Co-Author:**Panagiota Axelithioti, Scikoop Inc, Greece

We propose an approach to Education for Sustainable Development (ESD) that aims at incorporating actions as part of the educational process to grasp Sustainable Development (SD). This is achieved through conceptualising ESD using a critical thinking (CT) lens. Critical thinking enhances thought processes that use tools such as analysis, evaluation of information, interpretation, open-mindedness, and rigour of sources to determine the formation of an opinion. Additionally, ESD encompasses the social, economic, and environmental dimensions of learning human interactions with the environment and their consequences. Applying a critical thinking lens allows for studying the dynamics of these interactions and consequences, which can enable students to discuss and debate sustainable development and drive action within their schooling experience. This is the first part of the study that presents the theoretical background. Using CT as the framework we explore three classroom approaches those of holism, pluralism and action-oriented learning, interwoven with one another through inquiry and investigation.

Reinterpreting Pedagogical Diagnostics for Implementation in Teacher Education Programmes

Keywords: Assessment Methods and Tools, Developmental Processes, Pre-service Teacher Education, Teaching/Instruction

Presenting Author:Claudia Schreiner, University of Innsbruck, Austria, Austria; **Co-Author:**Christian Kraler, Teacher Education and School Research, Austria

Pedagogical diagnostics have gained in importance for teaching and learning and have acquired a partly reinterpreted meaning based upon PISA on the one hand and societal changes of the last decades on the other hand. Current implementations of pedagogical diagnostics in the curricula for teacher education programmes vary widely in structure, content and extent. In this contribution we present the approach adopted by the Consortium of Teacher Education West in Austria in conceptualizing pedagogical diagnostics for implementation into the curriculum for pre-service teacher education for secondary schools. A formative evaluation of the respective module based on a systematic data collection amongst teacher educators and students has been conducted in the past two years. Findings will be presented in order to show the basis for next steps in development.

Session L 8

25 August 2021 09:00 - 10:00

Session Room 10

Poster Presentation

Higher Education, Learning and Social Interaction, Teaching and Teacher Education

Collaborative Learning

Keywords: Bilingual Educator, Collaborative Learning, Competencies, Cooperative/Collaborative Learning, Higher Education, Metacognition, Mixed-method Research, Multicultural Education, Peer Interaction, Problem Solving, Self-efficacy, Self-regulation, Social Interaction, Teacher Professional Development, Video Analysis

Interest group: SIG 08 - Motivation and Emotion, SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education, SIG 16 - Metacognition

Chairperson: Franziska Vogt, Switzerland

Investigating the relation of situational self-efficacy and participation in group level regulation

Keywords: Collaborative Learning, Self-efficacy, Self-regulation, Video Analysis

Presenting Author:Sara Ahola, University of Oulu, Finland, Finland; **Co-Author:**Jonna Malmberg, University of Oulu, Finland; **Co-Author:**Hanna Jarvenoja, University of Oulu, Finland

The research has shown that learners' self-efficacy beliefs can influence how they engage in regulating their learning. However, less is known about how situational self-efficacy beliefs relate to learners' participation in group level regulation activity during collaborative learning. The aim of this study is to first investigate how self-efficacy varies in the course of collaborative learning. Then it is investigated how situational self-efficacy relates to learners' participation in the regulation activities taking place between group members during collaboration. Participants of the study were high school students collaborating in small groups of 3-4 learners during four collaborative physics lessons. Data consists of pre and post self-reports from each session measuring learners' task specific self-efficacy beliefs, and video recordings of collaborative group work revealing occurrences of group level regulation and participation in regulation. The results of this study illustrate how learners' self-efficacy beliefs vary across the collaborative physics sessions. Also, the results reveal how learners' participation in group level regulation activity during those sessions manifests through different participation roles. The study contributes to the theoretical understanding of the role of individual's motivational conditions in group level regulated learning processes by focusing on how situational self-efficacy beliefs relate to the way group members participate in group level regulation activity during collaborative learning.

A Scoping Review on Concepts and Interventions of Socially Shared Metacognitive Regulation

Keywords: Collaborative Learning, Cooperative/Collaborative Learning, Metacognition, Self-regulation

Presenting Author:Mari Ader, Faculty of Educational Sciences - Open University of the Netherlands, Netherlands; **Co-Author:**Jan van Bruggen, Open University, Netherlands; **Co-Author:**Marjan Vermeulen, Heerlen Open Universiteit, Netherlands

In order to grasp learning in collaborative learning environments, it is insufficient to solely focus on the individual regulation of learning. The quality of learning in groups also depends on shared regulation. Jointly regulating a group's learning process towards a shared learning goal is defined as socially shared metacognitive regulation (SSMR). The literature presents evidence that SSMR enhances learning performance. At the same time, however, there is confusion regarding the definition and understanding of SSMR in both research and practice. Due to the proliferation of social regulation research in the past decades, the concept of SSMR is used increasingly throughout educational sciences literature. Notwithstanding the number of studies, there is a lack of common theoretical constructs, operationalizations, measurements, and interventions to elicit SSMR processes. Various conceptualizations of SSMR have resulted in inconsistencies within research and difficulties to generalize across studies. An overview of SSMR concepts is needed to obtain a framework for the constructs and operationalizations and to improve theoretical understanding. This paper presentation provides an inventory and analysis of the theoretical constructs and their operational definitions in the field of SSMR. Further, it offers clarity into the terminology used in the field, identifies gaps in the literature, and points to future directions for research and instructional guidelines for supporting SSMR in educational settings. First, SSMR interventions from previous research are reported. Subsequently, five frameworks of SSMR were analyzed and empirical findings of SSMR elicitation are presented.

Sequences of participatory roles and metacognitive regulation during collaborative learning

Keywords: Collaborative Learning, Metacognition, Peer Interaction, Social Interaction

Presenting Author:Olli-Pekka Heinimäki, University of Turku, Finland; **Co-Author:**Tuuke Iiskala, University of Turku, Finland

This study explored sequences of spontaneously self-adopted roles and social forms of metacognitive regulation (MR) in computer-supported collaborative science learning. The participants were high school students, who undertook a research project in small groups of three students. Two higher- and two lower-performing groups, as assessed based on the outcome of their research projects, were selected for the study. First, roles and verbalized MR were coded from videotaped interactions of two task phases (planning & concluding). Second, lag sequential analysis was used to study how different types of roles related to the emergence of MR within groups. Preliminary findings indicate that certain types of roles were more likely to trigger MR, providing insights into explaining more and less successful group performance.

Studying psychophysiological conditions enabling cognitive regulation in collaborative learning.

Keywords: Collaborative Learning, Metacognition, Mixed-method Research, Self-regulation

Presenting Author:Márta Sobociński, University of Oulu, Finland; **Co-Author:**Andy Nguyen, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland

Socially-shared regulation of learning (SSRL) has been identified as necessary for successful collaborative learning, and it involves setting joint goals, monitoring progress and regulating learning as needed. Supporting face-to-face collaborative learning with adaptive technologies requires recognizing in real-time when learners need support. In recent years, physiological signals have been used to study, understand and support learning processes. Electrodermal activity (EDA) can provide insight into arousal level, and heart rate variability (HRV) has been shown to signal cognitive load. The aim of this study is to explore whether the combination of these two physiological measures can identify time windows when the group potentially faces a cognitive challenge that requires SSRL. Data has been collected during four collaborative sessions from 30 groups of three members during a science course in a secondary school. The data has been segmented into 30 second windows covering at least one group member having high arousal based on EDA and high cognitive load based on their marked HRV. High arousal-high cognitive load was qualitatively coded for type of interaction (metacognitive, socio-emotional, other) to study the regulatory response. The results will contribute to the growing literature in using multimodal big data to identify markers of regulated learning and proposes a method for identifying cognitive challenges requiring group-level regulation in real time.

Professional Competence and Development of Bilingual Education Teachers

Keywords: Bilingual Educator, Competencies, Multicultural Education, Teacher Professional Development

Presenting Author:Luisa Scherzinger, University of Tübingen, Germany; **Co-Author:**Taiga Brahm, University of Tübingen, Germany

The ongoing globalisation calls forth a need to increase intercultural competences as well as language skills. Bilingual education is one possible format to achieve this goal from an early age. It requires a high level of teacher professionalism. However, research in the field of bilingual education mainly focuses on students whereas a comprehensive overview of teacher competences is still missing. To fill this research gap, this paper conducts a systematic literature review focused on empirically observed and theoretically derived requirements of bilingual education teachers (BETs) regarding their professional competence and development. In addition to language skills, an example of such requirements is the ability to interweave subject and language requirements.

Solving problems collaboratively, but remotely in higher education: Relevance of pedagogical design

Keywords: Collaborative Learning, Cooperative/Collaborative Learning, Higher Education, Problem Solving

Presenting Author:Bhavna Rawat, University of Oulu, Finland, Finland; **Co-Author:**Pirkko Siklander, University of Oulu, Finland, Finland; **Co-Author:**Niina Impiö, University of Oulu, Finland

Solving complex working life problems in education is a challenge, and achieving successful collaboration being remotely during problem-solving is another challenge. Although collaboration has proved to be an effective way in learning, it does not take place just by putting people together (Buch & Andersen, 2015; Dillenbourg, Järvelä, & Fisher 2009). By using a design-based approach, we have developed a CPS pedagogical design (Author, et al. 2021, and implemented it

in intercultural higher education context. All together 42 students took part in the three different CPS courses (10 ects each) and aim in this study was to explore students' perspectives on their collaborative learning, and relevance of the CPS design to collaboration. The following research questions were set: 1) Which elements trigger collaboration during the CPS process? and 2) Which elements hinder collaboration during the CPS process? Thematic analysis resulted in elements that trigger and hinder students' collaboration. Elements highlight the role of pedagogical design, individuals, groups and mentors. The study shows the complex and complicated nature of collaboration, problem-solving and remote interaction (eg. Dillenbourg et al. 2009), both in individual and group level. Although pedagogical CPS design directs students' co-operation, helps group formation and steers co-regulation of learning, it also tends to overscript the process. Group-level collaboration is highly successful, although task-understanding and unequal participation affect negatively. Working remotely sets new challenges particularly in group level. However, the relevance of the CPS design for collaboration and problem-solving is prominent and it is an effective way to learn learning skills.

Session L 9

25 August 2021 09:00 - 10:00

Session Room 1

Poster Presentation

Assessment and Evaluation, Developmental Aspects of Instruction, Motivational, Social and Affective Processes, Teaching and Teacher Education

Self-regulation and Self-efficacy

Keywords: Assessment Methods and Tools, Developmental Processes, E-Learning/Online Learning, Metacognition, Motivation, Parental Involvement in Learning, Self-efficacy, Self-regulation, Student Learning, Teacher Effectiveness, Teacher Professional Development, Teaching/Instruction, Video Analysis

Interest group: SIG 01 - Assessment and Evaluation, SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education, SIG 16 - Metacognition

Chairperson: Ania Tadlaoui-Brahmi, HEP Fribourg, Switzerland

Professional Vision Practices in Video Intervention: Can Self-Regulated Learning Make a Difference?

Keywords: Assessment Methods and Tools, Self-regulation, Teacher Professional Development, Video Analysis

Presenting Author:Orna Heaysman, School of Education, Bar-Ilan University, Israel; **Presenting Author:**Bracha Kramarski, Bar-Ilan University, Israel

Professional vision (PV) is the way teachers observe and notice pedagogical events, give reasons for them, and predict their outcomes. Supporting teachers' PV is known to be an effective tool in training and professional development programs, and particularly in the self-regulated learning (SRL) field. The most common tool for PV training is video-analysis. Although many studies have been done on teachers' PV via video-analysis, not many focused on SRL and its transfer (the ability to use it across different contexts). Our goal in this study was to explore the following questions that so far remained inconclusive: Do teachers gain more insight by being objective about the practice they watch on video (i.e. a stranger teach) or by being personally involved (watching their own practice)? Can teachers transfer the knowledge gained by PV video-analysis training in their subject area to another subject area? And, will an intervention focused on SRL make a difference to PV abilities? These questions were tested in a quasi-experimental study, 67 teachers participated in two groups: experimental and control group. The experimental group participated in an SRL supporting program that used PV training in a video and simulation-based learning environment, while the control group participated in a meaningful learning program that used video but did not include PV or SRL support. To test the research questions, we used repeated-measures ANOVA. The results and their implications for teacher training and development will be discussed.

Teachers' Self-regulation in different disciplines: Do authentic experiences matter?

Keywords: Assessment Methods and Tools, Self-regulation, Teacher Professional Development, Video Analysis

Presenting Author:Bracha Kramarski, Bar-Ilan University, Israel; **Presenting Author:**Orna Heaysman, School of Education, Bar-Ilan University, Israel

Self-regulated learning (SRL) is a crucial skill for the autonomous learner; however, teachers find it challenging to implement in the classroom even when attending SRL professional development. In this study, we planned an effective professional development program that integrates theory and practice, with unique, authentic experiences of video-based learning and simulations with live actors. Although previous studies have examined the development of SRL among teachers, the effect of the context in which it is learned and taught is still unclear. The goal of the current study was to compare the SRL development following the intervention program among teachers from two different but critical subject domains: language and math, in lesson *planning* and lesson *performance* of three SRL practices: cognitive strategies, metacognitive strategies, and knowledge construction. In a quasi-experimental study, 67 teachers participated in the integrative intervention program. Repeated measures ANOVA revealed that although all teachers showed significant improvement in all measures, the groups were not identical in their practices. Implications for teachers' training and professional development will be discussed.

Child's Self-Regulated Learning (SRL) and Mother's SRL, Metaprocesses, and External Regulation

Keywords: Developmental Processes, Metacognition, Parental Involvement in Learning, Self-regulation

Presenting Author:Adar Ben-Eliyahu, University of Haifa, Faculty of Education, Israel; **Co-Author:**Lihi Sarfaty, University of Haifa, Faculty of Education, Israel

At the heart of both basic knowledge-building and process-oriented skills is one's ability to *self-regulate*—the ability to monitor and adjust toward desired outcomes. Implemented as part of learning, self-regulated learning (SRL) has been investigated as cognitions, emotions, and behaviors that advance learners toward learning goals. For young children, parents' perceptions and support of these processes may play a key role in their children's success, especially with much learning shifted to the home environment through distance learning. The current study queried 357 mothers of 1st-3rd graders regarding their knowledge of their cognitions (metacognition), behaviors (metabehavior), emotions (metaemotion), cognitive SRL (attention), behavioral SRL (planning), emotional SRL (reappraisal and suppression), and external regulation (coregulation and other-regulation). These were examined for associations with their child's SRL. In looking at the overall findings, parents' metaemotion was positively associated with their children's use of emotional SRL, and metabehavior was associated with behavioral SRL. Surprisingly, metaemotion was also related to behavioral SRL, and metabehavior was also associated with emotional SRL. All types of parental SRL were associated with their child's SRL. In addition, parents' reappraisal emotion SRL was related to their children's behavior SRL. Regarding external regulation, coregulation was positively associated with reappraisal emotion SRL, math achievement, and behavioral SRL, but negatively associated with attention SRL. Other-regulation was positively associated with child attention SRL and negatively associated with math achievement. There were slight variations in findings depending on at-school or distance-learning, and implications for caring adults supporting children's learning are discussed in the differing contexts.

What are we really aiming for? Identifying concrete student behavior in formative assessment

Keywords: Assessment Methods and Tools, Self-regulation, Student Learning, Teacher Professional Development

Presenting Author:Judith Gulikers, Wageningen University, Netherlands; **Co-Author:**Marijke Veugen, Wageningen University and Research Centre, Netherlands; **Co-Author:**Liesbeth Baartman, Utrecht University of Applied Sciences, Netherlands

Educational institutions all over the world are changing their assessment practices towards more formative assessment (FA), with the intention to stimulate students to take more ownership of their learning, be more motivated for learning or be more self-regulated learners. While FA has the potential to stimulate these kinds of outcomes, it difficult to grasp what they actually mean in concrete student behavior in the classroom. As FA is a dyadic and dynamic process in which teacher-student interaction is imperative, both teacher and student classroom behavior are critical in the formative assessment process. This participatory study examines together with 24 secondary school teacher(teams) participating in two FA professional development trajectories and 27 individual secondary education teachers what concrete student behavior they intend to stimulate via using more FA in their classroom. The FA-cycle, describing the formative assessment process in five aligned phases (Authors, 2016) is used as a theoretical and analytical frame. Teachers were asked to describe as concrete as possible student behavior per FA-phase. Qualitative analyses with three researchers resulted in themes per FA-phase and across the whole FA-process. Results show that teachers find it hard to describe concrete student behavior. When teacher teams succeeded in describing more concrete students behavior, they reported this helped them to see what that means for their own formative behavior in the classroom. This participatory study gives concrete ideas for both

implementing FA in the classroom as well as how to grasp its effects in terms of concrete student behavior.

Oral feedback in the foreign language classroom: Student perceptions and the role of proficiency

Keywords: Motivation, Self-efficacy, Self-regulation, Teaching/Instruction

Presenting Author: Yoshiyuki Nakata, Doshisha University, Japan; **Co-Author:** W. L. Quint Oga-Baldwin, Waseda University, Japan; **Co-Author:** Atsuko Tsuda, Hyogo Prefectural Kawanishi Midoridai Senior High School, Japan

The study investigates the effect of different types of oral feedbacks on student language learning motivation, which consists of *feedback only with motivational scaffolding*, *explicit informational/corrective feedback*, subjective/evaluative positive feedback with informational feedback, and *implicit informational feedback using non-controlling language*. Participants consist of 112 first-year high school students. Quantitative and qualitative data collection include (1) a questionnaire reporting retrospective responses to the different types of feedback in lower secondary school, (2) a questionnaire recording current experiences of feedback at high school, and (3) a follow-up questionnaire ranking ideal teacher feedbacks and perceived frequency of feedback use. Findings first indicate that students do not perceive particularly strong differences in the motivational effect of these types of feedback; individual variance for responses appeared relatively low. Responses at each level further appear to correlate to proficiency level and class assignment, indicating a potential role for ability beliefs and within group effects on feedback perceptions.

Efficacy, Autonomy, and Clarity: Fostering Agentic Engagement Online

Keywords: E-Learning/Online Learning, Motivation, Self-efficacy, Teacher Effectiveness

Presenting Author: Jeff Vomund, George Mason University, United States; **Co-Author:** Angela Miller, George Mason University, United States; **Co-Author:** Melissa Broeckelman-Post, George Mason University, United States

With the recent transition to more frequent online learning due to the COVID-19 pandemic, ensuring high student engagement, and particularly agentic engagement, may be more critical than ever. We employ two student self-efficacy constructs (online learning and online communication) and two constructs that measure student perceptions of teacher behavior (autonomy support and teacher clarity) in a sequential regression in order to determine how they might influence agentic engagement in an online Communication course. Results suggest that the more specific self-efficacy construct, online communication self-efficacy, has a more persistent effect on student agency. Further, as with in-person learning, perceived autonomy support is critical in developing student's agentic engagement. We tested for teacher clarity because it has been shown to impact classroom management and effective communication for in-person learning, and both management and effective communication may be particularly important in online contexts. Results suggest that teacher clarity does in fact influence student agency. Importantly, both student perception variables were significant in predicting student agency even when self-efficacy had been taken into account. We close by discussing future directions for research.

Session L 10

25 August 2021 09:00 - 10:00

Session Room 13

Poster Presentation

Assessment and Evaluation, Higher Education, Instructional Design

Writing and Literacy

Keywords: Argumentation, Assessment Methods and Tools, Citizenship Education, Collaborative Learning, Competencies, Experimental Studies, Higher Education, History, Language (L1/Standard Language), Multimedia Learning, Primary Education, Qualitative Methods, Secondary Education, Teaching/Instruction, Writing/Literacy

Interest group: SIG 12 - Writing, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Eleftheria Gonida, Aristotle University of Thessaloniki, Greece

Empowering Secondary School Students' Argumentative Writing Skills.

Keywords: Argumentation, Collaborative Learning, Secondary Education, Writing/Literacy

Presenting Author: Yana Landrieu, Ghent University, Belgium; **Co-Author:** Fien De Smedt, Ghent University, Belgium; **Co-Author:** Hilde Van Keer, Ghent University, Belgium; **Co-Author:** Bram De Wever, Ghent University, Belgium

This proposal aims to outline an overview of three consecutive studies: a state-of-the-art study, a first and second-iteration intervention study. The state-of-the-art study and the first intervention study will be outlined during the poster session. More than ever, argumentative writing skills are imperative for participation in our 21st century society. The majority of students do not develop writing skills naturally and education fails to effectively promote these skills (NCES, 2012).

Therefore, the main aim is to gain insight in how to support 11th and 12th-grade students adequately in acquiring argumentative writing skills. By combining two promising approaches, (1) explicit instruction regarding the writing process (i.e., cognitive strategic support) and (2) explicit instruction on collaboration (i.e., conversational support), argumentative writing skills are enhanced. To our knowledge, only one study (Granado-Peinado, Mateos, Martín, & Cuevas, 2019) focusses on the effectiveness of combining both approaches.

Teaching (academic and professional) writing for participation in society

Keywords: Citizenship Education, Higher Education, Qualitative Methods, Writing/Literacy

Presenting Author: Vibeke Christensen, University of Southern Denmark, Denmark; **Co-Author:** Peter Hobel, Institute for the Studies of Culture, University of Southern Denmark, Denmark

This is the second of two consecutive abstracts reporting and discussing results from a development and research project on academic writing in BA programs at the humanities. This presentation is investigating writing and writing competencies in educational and professional settings in order to discuss the function of academic and professional writing for active citizenship. The starting point is the results of the character of feedback provided by writing tutors reported in the former presentation. The discussion is based on a case study on a single BA program. In addition to the investigation of feedback, a document analysis of course regulations is accomplished to gain knowledge of the understanding of writing in the program. The understanding, of first the expectations of the students' academic and professional writing and second, the knowledge on the feedback provided, forms the basis for discussing perspectives regarding teaching academic writing for participation and contribution to society in the future. This part of the double presentation is a work in progress.

Academic writing, feedback and Disciplinary Writing Tutors

Keywords: Assessment Methods and Tools, Higher Education, Qualitative Methods, Writing/Literacy

Presenting Author: Peter Hobel, Institute for the Studies of Culture, University of Southern Denmark, Denmark; **Co-Author:** Vibeke Christensen, University of Southern Denmark, Denmark

This is the first of two consecutive abstracts reporting and discussing results from a development and research project on academic writing in BA programs at the humanities. In order to scaffold BA-students' development of academic writing and learning, a development and research project was accomplished at a Danish university. MA students were taught to be Disciplinary Writing Tutors before providing feedback to BA students' disciplinary academic writing. The aim of this paper is to identify: *What characterises the feedback offered by disciplinary writing tutors?* The presentation is positioned in a sociocultural framework that draws on theories of disciplinary literacy and academic literacies (Lea & Street, 1998). The analysis is based on a qualitative ethnographic research study conducted at various BA programs using Disciplinary Writing Tutors. In the presentation, feedback from writing tutors at two programs are brought into focus. The data is analysed in a text and a learning perspective. The main findings are: limited feedback is given on a sentence level, e.g. construction of valid explanations and argumentation; the tutors seem to provide feedback based on an understanding of academic writing as *study skills* and *academic socialization*. The findings are discussed in two perspectives · how can the course for future Disciplinary Writing Tutors be improved? · how can disciplinary

writing prepare the students for active participation in professional and civil life?

Concessive text procedures as an indicator of writing competency in 4th grade persuasive texts

Keywords: Competencies, Language (L1/Standard Language), Primary Education, Writing/Literacy

Presenting Author:Veronika Österbauer, IQS, Austria; **Co-Author:**Antonia Bachinger, Federal Institute for the Quality Assurance in the Austrian School

System, IQS, Austria; **Co-Author:**Gabriele von Eichhorn, Institut des Bundes für Qualitätssicherung im österreichischen Schulwesen (IQS), Austria; **Co-Author:**Michael Prof. Dr. Krelle, Chemnitz University of Technology, Germany

Numerous models illustrating writing skills make use of the concepts of writing processes and text products. For L1 didactics in German, Helmuth Feilke (2012) introduces the theory of "procedures", an intermediate level located between the writing process and the finished text, similar to what others called e.g. patterns or frame-markers (Hempel & Degand, 2008; Smith, 2003). Text procedures focus on different levels of text organization, including lexical elements like collocations, syntactical patterns and textual phenomena (Feilke, 2012: 7-11, 17-18). According to Steinhoff (2007), the use of procedures is an indicator for writing competency. For our study, we analyzed persuasive texts[1] from 4th grade students in Austria, who completed the national assessment BIST-Ü in 2015. We examined the students' use of text procedures for making a concession, which is a valid indicator of argumentative writing competencies (Petersen 2013: 58). We are looking for qualitative features of different concessive procedures taking syntactical complexity, correctness of use and the text quality from the BIST-Ü rating into account. We collected data from 1860 student texts by counting concessive procedures. From this data, we hope to refine the model and draw conclusions on its empirical validity. For example, we expect to see no linear relationship between the frequency of use of the procedures and test score due to qualitative differences of the used procedures. Hence, syntactically complex, two-part procedures should be found more frequently in texts from proficient students.

[1] Students should convince teachers or parents. They were tasked to argue their point and anticipate counterarguments.

An Investigation into Measures of Linguistic Accuracy in Written Corrective Feedback Research

Keywords: Assessment Methods and Tools, Experimental Studies, Teaching/Instruction, Writing/Literacy

Presenting Author:Nang Kham Thi, University of Szeged, Doctoral School of Education, Hungary

Abstract Providing corrective feedback (CF) in teaching L2 writing has long been of instructional practice, aiming to facilitate learners to improve writing proficiency. Within this context, the improvement of L2 learners' writing performance following different feedback types is primarily measured by short-term and long-term accuracy improvements on their written texts. However, the availability of different measures of linguistic accuracy and the use of various accuracy measures in the current written CF studies render it difficult to compare findings across empirical studies. This paper overviews the most widely-used measures of linguistic accuracy in the last two decades and stresses the importance of reporting the intra- and interrater reliability and detailed scoring guidelines to make replication studies possible. The findings suggest that measures including error ratio, obligatory occasion analysis, and holistic ratings were the most often employed measures, having their distinctive strengths and limitations in terms of distinguishing powers. The paper concludes with what continues to pose challenges in measuring linguistic accuracy and offer some recommendations on employing at least two measures of linguistic accuracy to examine the efficacy of written CF due to their limited capabilities.

Do image interpretation models foster students' historical thinking competencies?

Keywords: History, Multimedia Learning, Secondary Education, Writing/Literacy

Presenting Author:Kevin van Loon, PH FHNW, Switzerland

In history education, students must learn to use sources and accounts to be able to think historically. That means, they should develop competencies to reflect on historical events, including critical analysis and interpretation of sources. Beside texts, images are important means to engage students' historical thinking competencies. In history lessons these are popular and used extensively. But history textbooks and teachers rarely create assignments asking for a more thorough examination of images, requiring a reflective and critical thinking. Therefore, the function of images in history education merely has an illustrative character, rather than that students are required to examine these as historical sources. To support students with critical image analysis and interpretation, image interpretation models may help. Yet, it is still unclear whether and to what extent they foster students' historical thinking competencies. This research investigates how image interpretation models affect students' historical thinking skills. Secondary school students ($n = 145$) participated; they were randomly assigned to one of three groups: One group with a linear model from a recent history textbook, one with our developed dynamical model, and a Mind Map group, which acted as a control group. They were able to search the internet during the analysis and writing phase. Data is currently being coded, but preliminary findings show that students particularly had issues with contextualization, media critique, and causal reasoning. Findings on the comparison between the three groups will be presented at the EARLI conference.

Session L 11

25 August 2021 09:00 - 10:00

Session Room 18

Poster Presentation

Learning and Instructional Technology, Learning and Social Interaction, Teaching and Teacher Education

Early Childhood Education

Keywords: Attitudes and Beliefs, Case Studies, Early Childhood Education, Educational Technology, Inquiry Learning, Learning Technologies, Mixed-method Research, Motivation, Out-of-School Learning, Parental Involvement in Learning, Pre-service Teacher Education, Quantitative Methods, Social Interaction, Teaching/Instruction

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 11 - Teaching and Teacher Education, SIG 20 - Inquiry Learning

Chairperson: Marwin Felix Loeper, Paderborn University, Germany

Early Childhood Educator Individual And Collaborative Job Crafting

Keywords: Attitudes and Beliefs, Case Studies, Early Childhood Education, Inquiry Learning

Presenting Author:Janine Hostettler Schärer, PHSG, Switzerland

This study examines data from a case study in a Canadian daycare centre collected over a 16-month period. Four educators participated in theory/practice inquiry meetings, observation at the centre, and individual interviews. The concept of job crafting (Berg, Dutton, & Wrzesniewski, 2013) was used as a theoretical lens to investigate how these educators made sense of and crafted their work individually and collectively as a team, to make their work more meaningful. Professionalism for these early years practitioners meant trying to build trusting relationships with parents, while avoiding close relationships with children, in an environment based on fairness to all. Educators had indeed individual understanding of their job's requirements, but also collaboratively crafted their work in daily informal discussions, as there were no other opportunities for educators to engage in professional reflection and professional knowledge sharing.

The use of software solution to support children's transition from Pre-school to Primary School

Keywords: Early Childhood Education, Educational Technology, Mixed-method Research, Parental Involvement in Learning

Presenting Author:Gillian Lake, DCU, Ireland

There is a paucity of information transfer between preschools, primary schools and parents when children are transitioning from preschool to primary school in Ireland (O' Farrelly & Hennessy, 2013; O'Kane, 2016). Current optional templates are paper-based, generic and offer meaningful sharing of information. Parents are not often involved in this process. Software solutions could be used in order to bridge the information gap between parents, early years professionals (EYPs) and primary teachers and help to develop a shared responsibility for children's well-being during this significant period of their young lives (O' Farrelly & Hennessy, 2014). 49 EYPs, 92 parents and 30 primary teachers completed online questionnaires to ascertain their perceptions and understandings of transition, the sharing of information and the use of technology to support children during this period. Follow-up focus groups and semi-structured interviews were

conducted with a sub-sample of professionals, parents and primary teachers. Results showed that EYPs', parents' and primary teachers' agreed that information sharing should be based on three themes: Language, Social and Emotional development (including strengths and interests of the child) and adapting to more formal structured environment of primary school. Results also showed that parents have a desire to be more involved in this period and believe software can help. This resultant data has been used by an industry partner to develop a new transitions software solution which captures and shares information deemed relevant by each of the three stakeholders. It supports an ecological perspective on transitions to primary school (Rimm-Kaufman & Pianta, 2000).

Predicting early childhood education teacher candidates' views of coding

Keywords: Early Childhood Education, Motivation, Pre-service Teacher Education, Quantitative Methods

Presenting Author:Brian Belland, The Pennsylvania State University, United States; **Co-Author:**Anna Y. Zhang, The Pennsylvania State University, United States; **Co-Author:**Eunseo Lee, The Pennsylvania State University, United States; **Co-Author:**ChanMin Kim, The Pennsylvania State University, United States

In this paper, we investigate predictors of preservice, early childhood teachers' views of (a) coding, (b) how coding can be integrated into preschool classrooms, and (c) how coding relates to fields other than computer science. The predictor variables included: a) study in which students participated, b) semesters they have completed, c) prior programming knowledge, d) prior robot programming experience, e) scores for ten factors from presurvey, and f) inclusion of lesson design or not. There was an increasing trend in views of (a) coding, (b) how coding can be integrated into preschool classrooms, and (c) how coding relates to fields other than computer science for all five study groups. There were four significant predictors of views of coding: time, robot programming experience, views of coding, and intermediate programming knowledge. There were two significant predictors of how coding can be integrated in preschool classrooms: time, and perceptions of math. There were two significant predictors of views of how coding related to other fields: time and views of coding. Results are discussed in light of the literature.

Using lag sequential analysis to determine significant behavior transitions while debugging

Keywords: Early Childhood Education, Learning Technologies, Pre-service Teacher Education, Quantitative Methods

Presenting Author:Brian Belland, The Pennsylvania State University, United States; **Co-Author:**ChanMin Kim, The Pennsylvania State University, United States; **Co-Author:**Emre Dinc, The Pennsylvania State University, United States; **Co-Author:**Anna Y. Zhang, The Pennsylvania State University, United States

In this paper, we investigated common behavior transitions as early childhood teacher candidates engage in low-difficulty debugging tasks while supported by scaffolding. The focus of this study are 3 pairs of participants learned and experienced block-based coding for children's play and playful learning. The entire unit was recording through screencasting. Actions performed while debugging low- medium, and high-complexity debugging tasks were segmented, and each segment was assigned one of 40 codes. Lag sequential analysis was used to identify significant behavior transitions for each pair/debugging task complexity combination. Significant behavior transitions that are common to the three pairs are presented, and will be discussed in the full paper.

Effects of an intervention designed to promote the transfer of parents' language supporting skills

Keywords: Early Childhood Education, Out-of-School Learning, Parental Involvement in Learning, Quantitative Methods

Presenting Author:Alex Hodgkiss, University of Oxford, United Kingdom; **Co-Author:**Sandra Mathers, University of Oxford, United Kingdom; **Co-Author:**Victoria Murphy, University of Oxford, United Kingdom

The quality of parents' linguistic input plays a critical role in shaping children's language skills. However, there is significant variability in the language support parents provide. Shared reading interventions increase parents' use of language supporting strategies (e.g., open-ended questions). Using these strategies in situations beyond reading may confer additional benefits to children's language outcomes. Nevertheless, existing research suggests that parents' improved skills do not transfer to other contexts. To address this, we designed an intervention to support the transfer of parents' language supporting skills. 8 parents of 3–4-year-olds were assigned to an intervention group and 6 to a control group. In weeks 1–6, intervention parents practiced language supporting strategies during wordless picture book reading. In weeks 7–8, parents practiced these strategies when talking about shared experiences. Examples of the language supporting strategies were compared across both contexts to highlight the common language supporting skill. Before and after the intervention, parents took audio recordings with their child, while reading a wordless picture book (near transfer), reading a 'picture-and-text book' (intermediate transfer), and completing a toy play activity (far transfer). Results showed that parents in the intervention group used significantly more decontextualised (abstract) language during the toy activity, demonstrating far transfer. There were also non-significant mean differences favouring the intervention group in: open-ended prompts for both book activities; extensions for the picture-and-text activity; and, decontextualised language for the wordless picture book activity. These preliminary findings suggest it is possible to support parents to transfer their language supporting skills to new contexts.

Interaction quality in early child-care centers and its associations with structural characteristics

Keywords: Early Childhood Education, Quantitative Methods, Social Interaction, Teaching/Instruction

Presenting Author:Franka Baron, German Youth Institute, Germany; **Co-Author:**Dorothea Dornheim, University of Bamberg, Germany; **Co-Author:**Simone Lehr, University of Bamberg, Germany; **Co-Author:**Anja Linberg, German Youth Institute, Germany

Only few studies investigate how and with which quality-level teacher-child interactions occur between young children under the age of three years and their teachers in German crèches. Therefore, 280 two to three years old children attending German early child-care centers and their teachers are assessed in this study. Teacher-child interactions are rated with the Classroom Assessment Scoring System toddler version (CLASS Toddler, La Paro et al., 2012) in 70 child-care centers. Moreover, data on the teachers and the conditions within the child-care centers are collected through a self-report questionnaire. In the poster results of interaction quality ratings in German early child-care centers are presented and discussed in regard to their factorial structure and their quality level. Most notable results are highlighted. Furthermore, structural quality is considered as it might be associated with interaction quality in the sample. In addition, it is demonstrated which structural characteristic influence which dimensions of teacher-child interactions and thus might be important to improve interaction quality in the future. Also, recommendations are given on which aspects to prioritize in teacher trainings to support high quality interactions. Findings are discussed in terms of practice and policy implications and further research.

Session L 12

25 August 2021 09:00 - 10:00

Session Room 9

Poster Presentation

Assessment and Evaluation, Lifelong Learning, Teaching and Teacher Education

Pre-service and In-service Teacher Education

Keywords: Action Research, In-service Teacher Education, Interdisciplinary, Lifelong Learning, Metacognition, Mixed-method Research, Motivation, Pre-service Teacher Education, Primary Education, Science Education, Self-efficacy, Social Aspects of Learning and Teaching, Teacher Professional Development

Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education, SIG 16 - Metacognition

Chairperson: Josef Guggemos, University of St.Gallen, Switzerland

Participating in an academic lifelong learning course affects self-efficacy for teaching adults

Keywords: In-service Teacher Education, Lifelong Learning, Self-efficacy, Social Aspects of Learning and Teaching

Presenting Author:Nurit Gur-Yaish, Oranim Academic College of Education, Israel; **Co-Author:**Ronit Herscu-Kluska, Oranim Academic College of Education, Israel; **Co-Author:**Sara Pe'er, Oranim Academic College of Education, Israel

The aim of this study was to explore whether level of self-efficacy for teaching adults and level of ageism will change after participating in lifelong learning academic course. Eighteen M.Ed. students (78% of all students in the course) filled out a questionnaire before participating in an academic lifelong learning course and 12 (52% of all students) filled out a questionnaire after the course. Self-Efficacy for Teaching Adults (SETA) questionnaire, included 15 items, was designed for this study. The questionnaire content was validated by four experts. Ageism was tested by 'expectations regarding aging survey' that translated to

Hebrew. Students' SETA was higher after the course in comparison to before the course and these differences were statistically significant. Ageism was lower after the course in comparison to before the course, however, these differences were not significant. It is possible that the more practical aspects of the course, that included instructing a lesson, was a more meaningful learning activity that made the difference in feelings of efficacy to teach adults. The study sample was small, therefore generalizability behind the specific context should be made cautiously. The current study demonstrated the usefulness of administrating lifelong long learning course in colleges of education.

Metacognitive knowledge and skills among teachers who engage in a participatory action research

Keywords: Action Research, In-service Teacher Education, Metacognition, Science Education

Presenting Author: Shirley Miedjinsky, Oranim Academic College, Shamir Institute, University of Haifa, Israel; **Co-Author:** Irit Sasson, Tel-Hai College, Israel

This study examines metacognitive knowledge (MK) and metacognitive skills (MS) of in-service teachers who engaged in a professional development (PD) year-long course focused on conducting participatory action research (PAR) related to science instruction. We focused on MK components (knowledge of people, knowledge of task, and knowledge of strategies) and on MS (planning, monitoring and evaluating) components. A mixed research approach was used and the data included teachers' reflective journals; teachers' research proposal and their final reports. The findings indicate that knowledge of people and knowledge of task were evident along the process of the PAR. Knowledge of strategies and MS expressions were evident mostly at the implementation stage of the PAR and at the end of the course. Overall, it seems that implemented practice of PAR helped to both improve the teacher's MK and MS.

Supporting beginning teachers' professional identity: Studying an induction model in South Africa

Keywords: In-service Teacher Education, Mixed-method Research, Self-efficacy, Teacher Professional Development

Presenting Author: Ruben Vanderlinde, Ghent University, Belgium; **Co-Author:** Marguerite Müller, University of the Free State, Bloemfontein, Free State, South Africa, South Africa; **Co-Author:** Laura Monique Thomas, Ghent University, Belgium; **Co-Author:** Melissa Tuytens, Ghent University, Belgium; **Co-Author:** Loran Pieck, VVOB, South Africa

South Africa is urgently looking for newly qualified teachers who stay in the job. Parallel to other countries worldwide, South African teachers too leave the profession soon after entering the job. Induction models have been proven to positively impact the decision to remain in the job. However, in South Africa, induction models have not been implemented so far. Starting in January 2021, a one-year induction model will be piloted in the Free State Province of South Africa to increase beginning teachers' professional identity development. Professional identity is an important condition for teachers' professional learning and is strongly related to teacher retention. The induction model will entail 4 components, namely school-based mentoring, peer support, training sessions, and a personal development plan. This research project's aim is to conduct an exploratory field test of the implementation of this induction model. By using a mixed-method follow-up design, the project wants to explore the degree to which this implementation is successful and also uncover supporting/hindering factors hereby.

Why prospective elementary school teachers (don't) intend to teach Climate Change?

Keywords: Interdisciplinary, Mixed-method Research, Pre-service Teacher Education, Primary Education

Presenting Author: Petra Breitenmoser, Zurich University of Teacher Education & University of Zurich, Switzerland; **Co-Author:** Manuela Keller-Schneider, Zurich University of Teacher Education, Switzerland

Climate Change is a defining issue of our time. It is thus the responsibility of schools to help pupils building up knowledge and basic expertise on Climate Change (Lüschen 2015; Oelgeklaus 2012). However, Climate Change Education at primary-schools in Switzerland is still largely omitted even though pupils and (student) teachers likewise are interested in this topic (Adamina et al. 2018). Based on the theoretical Model by Keller-Schneider (2020), the perception of and dealing with requirements, such as teaching Climate Change, is influenced by individual resources and contextual factors. It is the aim of this study, to investigate on the expertise and intentions of prospective primary-school teachers to implement Climate Change in the classroom. It is of interest which requirements perceived as challenges by the students require an intensive consideration during the training and to what extent context factors are important. To do so, different aspects of knowledge on Climate Change, and other individual resources such as beliefs, motives, self-regulation, and emotions are examined. This study evaluates these aspects, explores how they change during an intervention, and analyses how they influence the intention of the students to teach Climate Change. To reach this goal, a mixed-methods approach is used drawing on a pre-/post-intervention survey (N=20) and interviews with student teachers (N=9) after completing an online-based intervention on Climate Change during lockdown in spring 2020. The theoretical model of Keller-Schneider (2020), adapted to this study, will be presented at the meeting alongside with results from the pre-test-survey und the interviews.

Motivated but overconfident? Effects of feedback on teacher self-efficacy and self-assessments

Keywords: Metacognition, Motivation, Pre-service Teacher Education, Self-efficacy

Presenting Author: Helen Ernst, University of Freiburg, Germany; **Co-Author:** Anja Prinz, University of Freiburg, Germany; **Co-Author:** Joerg Wittwer, University of Freiburg, Germany; **Co-Author:** Thamar Voss, University of Freiburg, Germany

Receiving performance feedback on a regular basis is important for motivational and cognitive aspects professional competence. However, especially teachers often lack systematic on-the-job feedback and feedback provided by students regarding their teachers' professional competence might be overly positive or negative, posing the question of how it affects self-regulation as a whole. In the present study, we investigate how two aspects of professional competence – task self-efficacy and metacognitive self-assessment – are differentially influenced by false vs correct task feedback. In a repeated measures design, student teachers of mathematics work on a content knowledge test. They state self-efficacy beliefs and predictions of performance before the first and the second half of the test and provide metacognitive judgments for each test item, respectively. After the first half, participants receive performance feedback that is either overly negative, overly positive or correct. We expect that overly positive feedback increases self-efficacy, but at the same time bias self-assessments, leading to overconfidence in one's test answers. Negative feedback should decrease self-efficacy and produce underconfidence. Only correct feedback should significantly increase self-assessment accuracy without producing a decrease in self-efficacy. This work adds to the discourse on feedback, as well as self-efficacy and metacognitive self-assessments as facets of teacher competence.

Research starting points of internship integrated practitioner research in initial teacher education

Keywords: Action Research, In-service Teacher Education, Mixed-method Research, Pre-service Teacher Education

Presenting Author: Katharina Heissenberger, Pädagogische Hochschule Steiermark, Austria; **Co-Author:** Sabine Reissner, Pädagogische Hochschule Steiermark, Austria; **Co-Author:** Gerda Kernbichler, Pädagogische Hochschule Steiermark, Austria; **Co-Author:** Georg Krammer, University College of Teacher Education Styria, Austria; **Co-Author:** Marlies Matischek-Jauk, Pädagogische Hochschule Steiermark, Austria

Practitioner research is an approach of research based learning aiming on the enhancement of professional learning through research orientation. According to the principles of this approach research starting points of are from subjective relevance to student teachers and include a research and a developmental perspective. The findings of the present mixed-methods study show which research topics are chosen by student teachers during internship integrated practitioner research projects and indicate that classroom management, method variety and teacher clarity are most frequently chosen and therefore from particular relevance for student teachers. These insights can deliver valuable impulses for individualized learning environments in initial teacher education.

Session L 13

25 August 2021 09:00 - 10:00

Session Room 16

ICT Demonstration

Teaching and Teacher Education

Developing Classroom Management Strategies in a Virtual-Reality Kindergarten Classroom

Keywords: Computer-assisted Learning, Higher Education, Learning Technologies, Pre-service Teacher Education

Interest group: SIG 11 - Teaching and Teacher Education

On a daily base, teachers make decisions on how to effectively manage their classrooms. However, selecting and applying effective Classroom Management Strategies (CMS) is one of the foremost concerns in everyday teaching especially when learning is situated in a dynamic setting such as a kindergarten classroom. Pre-service teachers experience difficulties in deciding between proactive (e.g., making eye contact) and reactive (e.g., disciplining) CMS when addressing specific behaviors often resulting in a negative spiral reinforcing disruptive behaviors. Therefore, we developed an interactive Virtual-Reality (VR) kindergarten classroom in which pre-service teachers can safely experience a variety of (disruptive) behaviors and experiment with and fine-tune different CMS. Our ICT-demonstration is open to all who would like to know more about using VR for training classroom management (or similar professional competencies). Our demonstration consists of three parts. We will start with an overview of the project including its (theoretical and educational) background, aims, methods, and findings, followed by a live demonstration in our university's VR-lab. We will showcase different aspects of our classroom management software (i.e., the instructor module and the virtual kindergarten itself) and the VR-lab classroom set-up, and give a short overview of how we run and guide the VR-sessions from a didactical point of view. After that, there will be an opportunity to ask questions, exchange experiences with using VR in teacher education, reflect on possible dilemma's, and discuss possibilities for applying VR to participants' own educational and/or research practices.

Developing Classroom Management Strategies in a Virtual-Reality Kindergarten Classroom

Presenting Author:Jolien Mouw, University of Groningen / GION, Netherlands; **Co-Author:**Marjon Fokkens-Bruinsma, University of Groningen, Netherlands; **Co-Author:**Andrea Snippe, University of Groningen / GION, Netherlands

On a daily base, teachers make decisions on how to effectively manage their classrooms. However, selecting and applying effective Classroom Management Strategies (CMS) is one of the foremost concerns in everyday teaching especially when learning is situated in a dynamic setting such as a kindergarten classroom. Pre-service teachers experience difficulties in deciding between proactive (e.g., making eye contact) and reactive (e.g., disciplining) CMS when addressing specific behaviors often resulting in a negative spiral reinforcing disruptive behaviors. Therefore, we developed an interactive Virtual-Reality (VR) kindergarten classroom in which pre-service teachers can safely experience a variety of (disruptive) behaviors and experiment with and fine-tune different CMS. Our ICT-demonstration is open to all who would like to know more about using VR for training classroom management (or similar professional competencies). Our demonstration consists of three parts. We will start with an overview of the project including its (theoretical and educational) background, aims, methods, and findings, followed by a live demonstration in our university's VR-lab. We will showcase different aspects of our classroom management software (i.e., the instructor module and the virtual kindergarten itself) and the VR-lab classroom set-up, and give a short overview of how we run and guide the VR-sessions from a didactical point of view. After that, there will be an opportunity to ask questions, exchange experiences with using VR in teacher education, reflect on possible dilemma's, and discuss possibilities for applying VR to participants' own educational and/or research practices.

Session L 14

25 August 2021 09:00 - 10:00

Session Room 11

ICT Demonstration

Motivational, Social and Affective Processes

Real-time capturing of emotional and behavioral student engagement trajectories during class

Keywords: Educational Psychology, Motivation and Emotion, Peer Interaction, Teacher Effectiveness

Interest group: SIG 08 - Motivation and Emotion

Numerous studies have shown that engaging in activities, such as asking questions and contributing to classroom discussions, termed as school engagement or academic engagement , seems to be crucial for learning processes and academic achievements (for review, see Rocca, 2010). Most researchers agree that classroom engagement, besides cognitive effort to learn, understand, and acquire knowledge (Newmann et al., 1992, Fredricks et al., 2004) encompasses emotional and behavioral engagement. It seems difficult and biased to measure data on emotion responses and raising the hand signalling behavioral engagment by self-reports or neutral observers. Two specific tools, which were used in currently running studies are shown, by which trajectories of emotional responses and behavioral engagement actions are recorded.

Real-time capturing of emotional and behavioral student engagement trajectories during class

Presenting Author:jorgos papastefanou, Bodymonitor Institute for physiological emotion analyses, Germany

Numerous studies have shown that engaging in activities, such as asking questions and contributing to classroom discussions, termed as school engagement or academic engagement , seems to be crucial for learning processes and academic achievements (for review, see Rocca, 2010). Most researchers agree that classroom engagement, besides cognitive effort to learn, understand, and acquire knowledge (Newmann et al., 1992, Fredricks et al., 2004) encompasses emotional and behavioral engagement. It seems difficult and biased to measure data on emotion responses and raising the hand signalling behavioral engagment by self-reports or neutral observers. Two specific tools, which were used in currently running studies are shown, by which trajectories of emotional responses and behavioral engagement actions are recorded.

Session L 15

25 August 2021 09:00 - 10:00

Session Room 14

ICT Demonstration

Learning and Instructional Technology

ReCo: A Shiny App for Automatically Coding Short Text Responses in Assessments

Keywords: Artificial Intelligence, Assessment Methods and Tools, Quantitative Methods, Technology

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

In this ICT demonstration, participants will see how to use the ReCo shiny app (Automatic Text Response Coder) for automatically coding text responses in assessments. For example, this can be used for scoring constructed responses as correct or incorrect. The session will start with an introduction to the employed methodology (i.a., Latent Semantic Analysis, classification and its evaluation) as well as exemplary use cases (e.g., scoring in PISA). The major part of the time, however, will be allotted to showing the app in a practical demonstration. For this, we will use a demo data set and walk through the app's workflow and settings. Furthermore, participants will learn how to continue working with ReCo's results outside of the app. shinyReCoR is offered as an R package with graphical interface so that no R knowledge is required. After the demonstration, participants will be able to use the freely available software for automatically coding text responses in their own assessments with their own data.

ReCo: A Shiny App for Automatically Coding Short Text Responses in Assessments

Presenting Author:Fabian Zehner, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Presenting Author:**Nico Andersen, DIPF | Leibniz Institute for Research and Information in Education, Germany

In this ICT demonstration, participants will see how to use the ReCo shiny app (Automatic Text Response Coder) for automatically coding text responses in assessments. For example, this can be used for scoring constructed responses as correct or incorrect. The session will start with an introduction to the employed methodology (i.a., Latent Semantic Analysis, classification and its evaluation) as well as exemplary use cases (e.g., scoring in PISA). The major part of the time, however, will be allotted to showing the app in a practical demonstration. For this, we will use a demo data set and walk through the app's workflow and settings. Furthermore, participants will learn how to continue working with ReCo's results outside of the app. shinyReCoR is offered as an R package with graphical interface so that no R knowledge is required. After the demonstration, participants will be able to use the freely available software for automatically

coding text responses in their own assessments with their own data.

Session L 16

25 August 2021 09:00 - 10:00

Session Room 17

ICT Demonstration

Learning and Instructional Technology

The E-Learning Setting Circle: A Digital Tool Guiding E-Learning Projects and Research

Keywords: E-Learning/Online Learning, Educational Technology, Learning Technologies, Technology

Interest group:

Digital learning relies on technological solutions that have been developed, introduced, and adapted across various disciplines and fields of research and practice. Therefore, there is a high demand for both sound theoretical frameworks as well as strong and converging evidence on how technological interventions and innovations best foster teaching and learning. However, the continuously increasing amount of empirical evidence also entails very heterogeneous and partly neglected project contexts, structures, and contents. To facilitate project planning, e-learning theory development, and decision-making, we conceptualized the E-Learning Setting Circle, an extensible model that depicts eleven critical issues regarding e-learning projects and research. Based on the E-Learning Setting Circle, we developed a digital tool meant to facilitate the visualization, identification, and related discussions regarding each critical issue. Here, we would like to present this tool and provide space for exchanging knowledge and experiences with each issue. We expect that a broad use of such a digital tool could initiate fruitful discussions on the meaning and relevance of each issue for research and practice. In the long term, documentations on such discourses could pave the way to more comparisons of evidence and more generalized evidence on learning with technology to support e-learning theory development and decision-making regarding e-learning projects and solutions.

The E-Learning Setting Circle: A Digital Tool Guiding E-Learning Projects and Research

Presenting Author:Marco Rüth, University of Cologne, Germany; **Co-Author:**Kai Kaspar, University of Cologne, Germany

Digital learning relies on technological solutions that have been developed, introduced, and adapted across various disciplines and fields of research and practice. Therefore, there is a high demand for both sound theoretical frameworks as well as strong and converging evidence on how technological interventions and innovations best foster teaching and learning. However, the continuously increasing amount of empirical evidence also entails very heterogeneous and partly neglected project contexts, structures, and contents. To facilitate project planning, e-learning theory development, and decision-making, we conceptualized the E-Learning Setting Circle, an extensible model that depicts eleven critical issues regarding e-learning projects and research. Based on the E-Learning Setting Circle, we developed a digital tool meant to facilitate the visualization, identification, and related discussions regarding each critical issue. Here, we would like to present this tool and provide space for exchanging knowledge and experiences with each issue. We expect that a broad use of such a digital tool could initiate fruitful discussions on the meaning and relevance of each issue for research and practice. In the long term, documentations on such discourses could pave the way to more comparisons of evidence and more generalized evidence on learning with technology to support e-learning theory development and decision-making regarding e-learning projects and solutions.

Session L 17

25 August 2021 09:00 - 10:00

Session Room 15

Sponsored Session

MDPI - Education Sciences

Keywords: Mixed-method Research, Qualitative Methods, Social Sciences, Synergies between Learning; Teaching and Research

Interest group:

Education Sciences (ISSN 2227-7102) is a scholarly international open access journal. It publishes extended full-length research papers that have the scope to substantively address current issues in education. There is no restriction on the length of the papers relevant to any field of study within education. Submissions that synthesize information from disparate backgrounds, place research findings within a broad context, extend our methodological and theoretical understanding, and have the likelihood of informing education policy and practice, are preferred. The journal publishes quantitative, qualitative and mixed method research papers. Extended reviews of substantive research studies and/or technical reports published elsewhere are also welcome. Additionally, Education Sciences invites commentaries and original opinion pieces and/or analysis of issues and events of concern to education scholars that have international resonance.

Our aim is to encourage researchers to publish their research in as much detail as possible. Full reports of findings and methodical details should be provided. Computed data or files, if available and unable to be published in a normal way, can be deposited as supplementary material. Online features can take advantage of the variety of media made possible through electronic publishing, including the use of audio, video, complex or dynamic graphic displays, interactive sessions, performances, and other means to improve the communication of scholarly work. Features may be presented as a single article or in serial form.

MDPI - Education Sciences

Presenting Author:Kelum Gamage, University of Glasgow, UK, United Kingdom; **Presenting Author:**Neil Gordon, University of Hull, United Kingdom;

Presenting Author:Nora McIntyre, University of Southampton, United Kingdom; **Presenting Author:**Milica Milosev, MDPI, Switzerland, Serbia

Education Sciences (ISSN 2227-7102) is a scholarly international open access journal. It publishes extended full-length research papers that have the scope to substantively address current issues in education. There is no restriction on the length of the papers relevant to any field of study within education. Submissions that synthesize information from disparate backgrounds, place research findings within a broad context, extend our methodological and theoretical understanding, and have the likelihood of informing education policy and practice, are preferred. The journal publishes quantitative, qualitative and mixed method research papers. Extended reviews of substantive research studies and/or technical reports published elsewhere are also welcome. Additionally, Education Sciences invites commentaries and original opinion pieces and/or analysis of issues and events of concern to education scholars that have international resonance.

Our aim is to encourage researchers to publish their research in as much detail as possible. Full reports of findings and methodical details should be provided. Computed data or files, if available and unable to be published in a normal way, can be deposited as supplementary material. Online features can take advantage of the variety of media made possible through electronic publishing, including the use of audio, video, complex or dynamic graphic displays, interactive sessions, performances, and other means to improve the communication of scholarly work. Features may be presented as a single article or in serial form.

Session L 18

25 August 2021 09:00 - 10:00

SIG 14: Developing connectivity between education and work: Principles and practices

Keywords: Computer-assisted Learning, Cooperative/Collaborative Learning, Lifelong Learning, Qualitative Methods, Vocational Education, Workplace Learning

Interest group: SIG 14 - Learning and Professional Development

Chairperson: Ilya Zitter, Hogeschool Utrecht (University of Applied Sciences Utrecht), Netherlands

Organiser: Simon Beusaert, Maastricht University, Netherlands

Discussant: Eva Kyndt, University of Antwerp, Belgium

Rising youth unemployment tends to spark discussions about the problematic transition from school to work for many young school leavers. When entering the labour market, young individuals are increasingly confronted with structural barriers in finding (high-quality) jobs (Elffers & Oort, 2013; Nilsson, 2010). As such, policymakers have expressed their belief in the potential of integrating workplace learning within educational trajectories as a solution for facilitating the transition from education to work and as such reducing levels of youth unemployment (Biavaschi et al., 2012). A report from the OECD (2010) argues that workplaces have the potential to offer strong learning environments and that workplace learning should play a role in every vocational training (OECD, 2010). Combining learning at school and in the workplace, is expected to provide a basis for lifelong learning, enhance transfer from school learning to practice, improve (job-specific) skill development, and reinforce academic skills and personal development (Poortman, 2007). However, the optimism about this integration is challenged by (the lack of) empirical evidence for this impact and how this impact can be obtained (e.g., Akkerman & Bakker, 2012; Bailey et al., 2004; Nijhof & Nieuwenhuis, 2008; Poortman et al., 2012). Both researchers as well as educational and organisational stakeholders are in need of insights that will support them in addressing these challenges (Kyndt, Beusaert, & Zitter, 2021). This symposium contains three papers that show how connectivity can be achieved. More specifically, general principles and possible interventions are discussed and illustrated by different cases from practice.

Teachers' use of digital boundary objects to connect school and workplace-based learning

Presenting Author:Nina Kilbrink, Karlstad University, Sweden; **Co-Author:**Ann-Britt Enochsson, Karlstad University, Sweden; **Co-Author:**Annelie Andersen, Karlstad University, Sweden; **Co-Author:**Annica Adefors, Karlstad University, Sweden

There are different kinds of gaps to bridge in relation to the students' learning in vocational education. In dual systems, some of these gaps are related to school and workplace-based learning, such as gaps in relation to coordinating; keeping track of; or creating possibilities for student learning. Hence, these gaps can concern for example administration, geographical distance or different views of learning. One way of bridging gaps in this area, which is the focus of this study, and to connect the two learning arenas, is to use digital boundary objects. To gain more knowledge on how this can be done, teachers at different vocational programmes in vocational education have been interviewed about their experiences of working with digital technology to connect school and workplace-based learning in Swedish vocational education. Their experiences show that depending on which gaps the teachers identify, and what pedagogical aims they have, the kind of technology used differ. In this paper, we discuss the importance of defining the pedagogical aim in relation to which gap to bridge and then choosing a suitable technology in this context.

Collaborative Communication between Teachers and Company Supervisors for Integrative Teaching

Presenting Author:Viviana Sappa, Swiss Federal University for Vocational Education and Training, Switzerland; **Co-Author:**Sarojini Choy, Griffith University, Australia; **Co-Author:**Carmela Aprea, University of Mannheim, Germany

This contribution explores the collaborative communication between teachers and company supervisors as a key aspect of connectivity in Vocational Education and Training (VET). Various scholars agreed that solid partnerships and effective collaboration between vocational schools and workplaces are needed to promote apprentices' integrated learning in different sites. However, the way in which such partnerships and collaboration affect teaching and learning across school and workplace settings is still unclear. Based on those considerations, the present study explores whether and how collaborative communication between schoolteachers and workplace supervisors facilitate the use of integrative teaching arrangements at school. Adopting an explorative qualitative research approach, we collected data from a sample of Australian, Swiss and German vocational schoolteachers. The findings confirm that collaborative communication is a facilitating condition for designing integrative teaching arrangements especially when oriented to a goal-driven and future oriented coordination or when focused on cooperation. However, in some cases integrated teaching can be implemented even without an intensive collaborative exchange between teachers and company supervisors, especially when the partnership is well established at the institutional or curriculum levels. The findings are discussed in relation to key structural differences between the three national VET systems.

Pedagogic strategies at the boundary of school and work

Presenting Author:Anne Khaled, HU University of Applied Sciences, Netherlands; **Co-Author:**Marco Mazereeuw, NHL Stenden University of Applied Sciences, Netherlands; **Co-Author:**Machiel Bouwmans, Utrecht University of Applied Sciences, Netherlands

Becoming an employee is increasingly associated with developing the will and ability to learn while working. It is therefore argued that students should be exposed to meaningful work and learning experiences throughout their vocational educational trajectory. Learning configurations at the boundary of school and work, with a close collaboration between schools and workplaces, are quite popular in Vocational Education and Training (VET). However, professionals such as teachers and workplace supervisors experience difficulties guiding students in contexts where school and work processes coexist and even intertwine. This paper reports on a study that examined which pedagogic strategies professionals use to support VET-students in such contexts. Guiding interventions and guiding professional's rationales to intervene of 30 guiding moments were analyzed. The results show guiding professionals who practice a more empowering pedagogic strategy, those who practice a more steering strategy and those who combine both. Based on these findings a pedagogic continuum of steering and empowering is proposed. The variation of pedagogic strategies on this continuum are illustrated with narratives and examples. The proposed reframing of guiding can be used to increase professional's awareness of student experiences at the boundary of school and work and increase the ability of these professionals to adaptively respond to that.

Keynotes II 1

25 August 2021 10:45 - 11:45

Auditorium B

EARLI Keynote Session

Learners' resources as moderators for instructional design, self-regulation and cognitive load

Keywords: Cognitive Development, Instructional Design, Motivation and Emotion, Self-regulation

Interest group:

Chairperson: Sanna Järvelä, University of Oulu, Finland

Educational research has substantiated many approaches to successfully support learning. By providing prompts, learning strategy trainings, annotations, signals, worked-examples, integrated multimedia designs or even desirable difficulties – to name only a few - we can foster learning. However, as successful as these approaches might be in research, very often studies do not succeed in replicating their positive results. Also, in practical contexts, learners fail to use these approaches successfully. This is where crucial learner characteristics come into play as moderators. Based on a constructivist view, learners do not or cannot use the same instructional impulse in the same way. The prominent line of research on aptitude- treatment-interactions underline these moderating effects. Well-known theories describe how learners subjective state or their appraisals influence e.g. emotion or motivation in learning. The crucial role of prior knowledge for learning is undisputable since Ausubel and it is well-proven. Very often, learners can only use instructional impulses if their prior knowledge is

sufficient and provides a fruitful ground for the triggered or requested processes. Thus, learners' resources – particularly but not solely learners' prior knowledge – can enhance the positive effects of instructional approaches, compensate for them if they are missing or can interfere when they are not aligned. In my keynote I will provide empirical evidence for moderating effects of cognitive and motivational learner characteristics, which can be trait- or state-like, in different areas of research. These areas mirror a journey through time of my research: First, in the area of supporting coherence formation in learning from multiple representations, second in instructional design research and last, in research on self-regulated learning. Based on an enlarged model of the interplay between learners' resources in self-regulation and cognitive load I will discuss that learners' resources do not only moderate the effects on learning outcomes but also do affect learners' cognitive load.

Learners' resources as moderators for instructional design, self-regulation and cognitive load

Presenting Author:Tina Seufert, Ulm University, Germany

Educational research has substantiated many approaches to successfully support learning. By providing prompts, learning strategy trainings, annotations, signals, worked-examples, integrated multimedia designs or even desirable difficulties – to name only a few - we can foster learning. However, as successful as these approaches might be in research, very often studies do not succeed in replicating their positive results. Also, in practical contexts, learners fail to use these approaches successfully. This is where crucial learner characteristics come into play as moderators. Based on a constructivist view, learners do not or cannot use the same instructional impulse in the same way. The prominent line of research on aptitude- treatment-interactions underline these moderating effects. Well-known theories describe how learners subjective state or their appraisals influence e.g. emotion or motivation in learning. The crucial role of prior knowledge for learning is undisputable since Ausubel and it is well-proven. Very often, learners can only use instructional impulses if their prior knowledge is sufficient and provides a fruitful ground for the triggered or requested processes. Thus, learners' resources – particularly but not solely learners' prior knowledge – can enhance the positive effects of instructional approaches, compensate for them if they are missing or can interfere when they are not aligned. In my keynote I will provide empirical evidence for moderating effects of cognitive and motivational learner characteristics, which can be trait- or state-like, in different areas of research. These areas mirror a journey through time of my research: First, in the area of supporting coherence formation in learning from multiple representations, second in instructional design research and last, in research on self-regulated learning. Based on an enlarged model of the interplay between learners' resources in self-regulation and cognitive load I will discuss that learners' resources do not only moderate the effects on learning outcomes but also do affect learners' cognitive load.

Keynotes II 2

25 August 2021 10:45 - 11:45

Auditorium A

EARLI Keynote Session

Learning Lives and Lived Citizenship - trajectories of participation and futuremaking

Keywords: Citizenship Education, Communities of Learners, Early Childhood Education, Out-of-School Learning

Interest group:

Chairperson: Roger Säljö, University of Gothenburg, Sweden

This presentation will focus on emergent activities and practices of learning that children and young people are involved in through their everyday lives, from the formal setting of the classroom to the informal settings in the home and local community. The concepts of 'learning lives' and 'lived citizenship' are used to unpack the meaning making of these activities and practices as experienced by young people themselves. The objective is to raise some key questions about the role of education and learning for young people today and their future orientations as citizens within specific communities and consider the implications this might have for the value of knowledge beyond the individualized epistemology of school. I will draw on work we have done using spatial-temporal approaches studying learners and their practices in diverse communities and contexts, and then focus on two main issues. One issue is about negotiations and tensions in classroom interactions between teachers and students when experiences and resources from out-of-school are made part of subject content and knowledge work in-school. Such tensions are also exemplified in ways of using digital media in- and out-of-school. Another issue is about 'futuremaking' as ways that young people reflect on themselves as learners and their relational agency drawing on past, present and future orientations, as ways of becoming citizens. Some of the methodological, conceptual and theoretical implications of this work will be discussed, and the aim is to explore and critically define ways that education can play a role for young people and communities by including learning beyond school, and through the lifecourse.

Learning Lives and Lived Citizenship - trajectories of participation and futuremaking

Presenting Author:Ola Erstad, University of Oslo, Norway

This presentation will focus on emergent activities and practices of learning that children and young people are involved in through their everyday lives, from the formal setting of the classroom to the informal settings in the home and local community. The concepts of 'learning lives' and 'lived citizenship' are used to unpack the meaning making of these activities and practices as experienced by young people themselves. The objective is to raise some key questions about the role of education and learning for young people today and their future orientations as citizens within specific communities and consider the implications this might have for the value of knowledge beyond the individualized epistemology of school. I will draw on work we have done using spatial-temporal approaches studying learners and their practices in diverse communities and contexts, and then focus on two main issues. One issue is about negotiations and tensions in classroom interactions between teachers and students when experiences and resources from out-of-school are made part of subject content and knowledge work in-school. Such tensions are also exemplified in ways of using digital media in- and out-of-school. Another issue is about 'futuremaking' as ways that young people reflect on themselves as learners and their relational agency drawing on past, present and future orientations, as ways of becoming citizens. Some of the methodological, conceptual and theoretical implications of this work will be discussed, and the aim is to explore and critically define ways that education can play a role for young people and communities by including learning beyond school, and through the lifecourse.

Session M 1

25 August 2021 12:00 - 13:00

Session Room 16

Symposium

Assessment and Evaluation, Learning and Social Interaction

Measuring Democratic Citizenship At School: One Measure Fits All?

Keywords: Assessment Methods and Tools, Attitudes and Beliefs, Citizenship Education, Ethnography, Interdisciplinary, Peer Interaction, Primary Education, Quantitative Methods, Secondary Education, Social Interaction

Interest group:SIG 13 - Moral and Democratic Education

Chairperson: Anke Munniksma, University of Amsterdam, Netherlands

Discussant: Anke Munniksma, University of Amsterdam, Netherlands

From an early age, children are actively participating in various societal contexts. In light of recent societal tensions, democratic citizenship in primary and secondary education is again subject of elaborate discussion in (inter)national educational policy and research. As a dynamic and multidimensional construct, ranging from political knowledge and participation to social norms and relationships (Council of Europe, 2016), citizenship in education does not allow for one measurement approach (cf. Hoskins et al., 2012). This confronts educational research with a poignant question: How to measure students' democratic citizenship in a multidimensional way? This symposium shines a light on the complementarity of three approaches for measuring diverse aspects of students' democratic citizenship and discusses how these together could describe democratic citizenship as a multidimensional construct. The first contribution focuses

on widely applied questionnaires, measuring both democratic, societal and social skills, and investigates to what degree these make reliable comparisons across different groups in society. The second contribution is a theoretical exploration of how peer relations research techniques and conceptualisations could be employed to investigate interpersonal aspects of democratic citizenship, proposing the use of peer nominations for mapping the classroom as a micro-society. The third contribution takes an observational, ethnographic perspective on teacher and student sayings and doings to investigate pedagogical and political forms of socialising and subjectifying processes of citizenship education. The three perspectives and possible combinations of them will be discussed by prof. dr. Kirs Kallio from the angle of 'lived citizenship': How students live and experience life as citizens.

Measuring Citizenship Competences: An Assessment of Measurement Invariance

Presenting Author:Lianne Hoek, University of Amsterdam, Netherlands; **Co-Author:**Anke Munniksma, University of Amsterdam, Netherlands; **Co-Author:**Anne Bert Dijkstra, University of Amsterdam, Netherlands

Questionnaires are widely used to measure students' citizenship competences. Over the years, studies using questionnaires demonstrated that citizenship competences are influenced by student characteristics such as sex, age, socioeconomic status and migration background. A prerequisite for meaningful comparisons across subgroups of a population is that the construct to be measured is understood and operationalized in a similar way in each context. This can be investigated by examining measurement invariance. The present study uses a sample of 5736 primary school students in the Netherlands to investigate measurement invariance based on sex, socioeconomic status and migration background. Using multi-group confirmatory factor analysis, a configural, metric, scalar and partial model were fitted to the data. Findings indicate that partial invariance could be established for sex, socioeconomic status, and migration background, which indicates that the latent means could be meaningfully compared across groups. Findings of subsequent analyses indicate that girls and students with a high socioeconomic status have a significant higher citizenship attitude. Comparing the means for students with and without a migration background yielded no significant result.

Acceptance and Conflict Resolution: How Can Peer Relations Help to Measure Democratic Citizenship?

Presenting Author:Minke Krijnen, Utrecht University, Netherlands; **Co-Author:**Tim Mainhard, Utrecht University, Netherlands; **Co-Author:**Bjorn Wansink, Utrecht University, Netherlands; **Co-Author:**Jan van Tartwijk, Utrecht University, Netherlands

This study is a theoretical exploration of how we can quantitatively, employing peer-relations methodology, examine democratic citizenship in elementary classrooms as micro-societies. Schools have a unique opportunity but also a legal responsibility to prepare children for living together and to foster democratic citizenship (European Commission/EACEA/Eurydice, 2017). Aside from learning democratic citizenship explicitly through lessons taught by teachers, children practice to live together with classmates in the classroom as, how Dewey described it, a 'micro-society' (Van der Ploeg, 2016). Within the classroom, children obtain a range of democratic citizenship competences to establish and maintain positive relationships with their classmates (Kallio, Wood, & Häkli, 2020; Lawy & Biesta, 2006). We propose how these competences could be quantitatively assessed using instruments prominent in peer relations research (Rubin, Bukowski, Parker, & Bowker, 2008) by zooming in on peer acceptance and constructive conflict resolution. As such, peer relations techniques could extend existing instruments for democratic citizenship in children, which is usually limited to self-report instruments (cf. Cleaver, Ireland, Kerr, & Lopes, 2005; Schulz et al., 2017; Ten Dam, Geijsel, Reumerman, & Ledoux, 2011) that do not take into account group characteristics of the classroom as micro-society nor the interpersonal nature of democratic citizenship competences.

Prioritising Practice: What Classroom Practices Teach us about the School's Role in Citizenship

Presenting Author:Margot Joris, KU LEUVEN, Belgium; **Co-Author:**Orhan Agirdag, KU Leuven / University of Amsterdam, Belgium; **Co-Author:**Maarten Simons, KU LEUVEN, Belgium

This contribution attempts to describe the role of schools in educating young people to become democratic citizens by starting from an internal pedagogical perspective on and the daily practices of schools, rather than external, top-down translations of societal and political norms and ideals. Building on research material of a small-scale ethnographic research in two secondary schools in Flanders (Belgium) and Brussels, it aims to bring to life, or give words to, classroom practices in terms of citizenship education. By giving priority to practices, the analysis shows how we should differentiate between pedagogical and political forms of socialising and subjectifying students when speaking about the role of the school and its potential in helping young people to become democratic citizens.

Session M 2

25 August 2021 12:00 - 13:00

Session Room 11

Symposium

Assessment and Evaluation

Measuring teaching quality: what measurement model should be applied?

Keywords: Assessment Methods and Tools, Psychometrics, Quantitative Methods, Secondary Education, Teacher Effectiveness, Teaching/Instruction, Video Analysis

Interest group: SIG 18 - Educational Effectiveness and Improvement

Chairperson: Giang Pham, Pädagogische Hochschule St.Gallen, Switzerland

Chairperson: Jan Hochweber, Switzerland

Organiser: Giang Pham, Pädagogische Hochschule St.Gallen, Switzerland

Discussant: Marcus Pietsch, Leuphana University Lueneburg, Germany

How do we measure teaching quality? Based on what measurement model? How do we justify it? In this symposium, three research groups approached these questions quite differently, even though they adopted the same definition of teaching quality (TQ) – teaching practices that provide a well-organized and supportive learning environment. The first group assumed TQ as a reflective construct. They developed a questionnaire and collected data on student perception of TQ to measure it as a latent construct and assessed the construct validity. A unidimensional measurement model – a combined item response theory and generalizability theory model – was chosen for this purpose. The second group questioned the theoretical justifiability of some assumptions underlying the commonly used second-order factor model to measure TQ's dimensions. To avoid possible biased estimates due to unreasonable model assumptions, they introduced the latent composite score model; quality dimensions are assumed formative constructs, accordingly. They compared the results of both models to show the viability of this new model. The third person suggested the network approach as a useful framework to conceptualize and model TQ and its dimensions. Within this framework, constructs are considered networks of causally interacting indicators instead of latent or formative constructs. The author argued the valid use and added values of this model based on theoretical considerations and illustrated them via a study using an existing dataset and the regularized partial correlation network. Differences between groups will be discussed towards a more transparent research practice in this regard.

Are student perceptions of teaching quality reliable measures for evaluating teaching quality?

Presenting Author:Hannah Bijlsma, University of Twente, Netherlands; **Co-Author:**Cees Glas, University of Twente, Netherlands; **Co-Author:**Adrie Visscher, Univ. of Twente, Netherlands

Student perceptions of teaching quality can be collected efficiently by means of the Impact! tool that enables students, using a digital device, to easily indicate the degree to which the lesson that just ended met several characteristics of effective teaching. However, the reliability and validity of student perceptions of teaching quality are subject of scientific debate. In this study, data from 26 teachers and their students were therefore analyzed to assess the construct validity of the Impact! questionnaire using a combined item response theory and generalizability theory model. Moreover, the global and local reliability of the scores were investigated. Results support the construct validity of the questionnaire. It was also found that the student Impact! scores are reliable measures of teaching quality. Significances of the findings and suggestions for future research are presented.

Measuring teaching quality domains: second-order factors or latent composite scores?

Presenting Author: Wolfgang Wagner, University of Tübingen, Germany; **Co-Author:** Richard Goellner, University of Tuebingen, Germany; **Co-Author:** Ann-Kathrin Jaekel, University of Tuebingen, Germany; **Co-Author:** Norman Rose, Universitätsklinikum Jena, Germany

Teaching quality frameworks typically distinguish between broad domains and several aspects (or facets) within each domain. From a methodological perspective, the question arises how these facets can be combined at the domain level. A very common approach is to establish a second-order factor with the domain-specific facets as indicators, which may theoretically not be justified and lead to biased effect estimates. A reasonable alternative might be the aggregation of the facets by a latent composite score. We compared results from both approaches by an empirical investigation of students' perceptions in the domain supportive climate (comprising eight facets) and their association with achievement based on data from a large study conducted in the German federal state of Baden-Württemberg. The differences regarding the interpretation of the results and the respective assumptions will be discussed.

Teaching quality: a network of causally interacting quality aspects?

Presenting Author: Giang Pham, Pädagogische Hochschule St.Gallen, Switzerland

Network approach has been introduced to reconceptualize several psychological concepts, from latent constructs and cause of their indicators into networks of causally interacting indicators, which arise from the causal interaction between network elements. This approach can be applied without problems to model and investigate teaching quality, given existing theoretical concepts of teaching quality, quality dimensions, and their indicators. In this paper, I reanalyzed the Swiss TIMSS 1999 video study data using the *regularized partial correlation network*. The results shed light on the open question regarding the relationship between classroom management and cognitive activation and their effects on student outcomes in mathematics. More importantly, studying teaching quality using this approach could help gain new insight into the mechanisms by which teaching quality and student outcomes can be enhanced.

Session M 3

25 August 2021 12:00 - 13:00

Session Room 7

Symposium

Instructional Design

How to Integrate Retrieval Practice Into Existing Educational Activities

Keywords: Computer-assisted Learning, Educational Psychology, Experimental Studies, Instructional Design

Interest group: SIG 06 - Instructional Design

Chairperson: Julian Roelle, Ruhr University Bochum, Germany

Organiser: Julian Roelle, Ruhr University Bochum, Germany

Discussant: Andrew Butler, Washington University, United States

The benefits of engaging learners in practicing retrieval of knowledge from memory are beyond dispute; it is established that retrieval practice enhances lasting learning. However, there is still a paucity of research concerning beneficial ways of integrating retrieval practice into existing educational activities such as performing generative tasks or watching instructional videos. Against this background, the aim of this symposium is to extend our knowledge regarding beneficial ways of integrating retrieval practice into different established activities. Contribution 1 investigates the benefits of enriching instructional video, which has become a popular means of delivering instruction, with retrieval practice. In Contribution 2, retrieval practice is implemented into the learning activity of generating and answering questions. Specifically, the authors investigate whether integrating retrieval practice only in the second part of the activity (i.e., answering the questions) is more beneficial than integrating it into both parts (generating and answering the questions), or no parts. Contribution 3 deals with optimizing the benefits of retrieval practice in learning from video lectures by providing learners with test questions already before they watch the lectures. Finally, Contribution 4 analyzes how retrieval practice should be combined with the generative task of elaborating. The authors analyze whether it is better to engage learners in retrieval practice only after they have engaged in elaboration or before they engage in elaboration. The different theoretical perspectives and the sound design of the experiments indicate that the symposium will point to fruitful conclusions concerning ways to integrate retrieval practice into existing educational activities.

Effects of Enriching Instructional Video Learning with Retrieval Practice Before or After Restudy

Presenting Author: Vincent Hoogerheide, Utrecht University, Netherlands; **Co-Author:** Twan van der Zanden, Utrecht University, Netherlands; **Co-Author:** Andreas Lachner, University of Tübingen, Germany; **Co-Author:** Gesa van den Broek, Utrecht University, Netherlands; **Co-Author:** Tamara Van Gog, Utrecht University, Netherlands

Instructional video is a popular and often effective way for students of all ages to learn. A downside to video learning is that most students first study and then restudy (parts of) the same video. This passive way of studying can impair learning because rather than paying attention to the video, students start thinking of other things (i.e., mind-wandering). The present experiment aimed to test a possible solution to this problem by enriching video learning with retrieval practice (RP). RP is an active study strategy that works for secondary education and higher education students, although it is less clear whether RP works with children and in the context of video learning. Primary school students ($N=87$) studied the same instructional video on photosynthesis twice (restudy condition), or additionally wrote down everything they remembered from the instructional video (i.e., free recall) before the restudy activity (video-RP-video condition) or afterwards (video-video-RP condition). After the learning phase, all participants completed a retention and comprehension test. Results showed no performance differences among the conditions on the comprehension test. We did find an effect on retention: only the video-RP-video condition performed better on the retention test than the restudy condition. Mind-wandering was low and did not differ across conditions. These findings suggest that retrieval practice can help children to remember more of the content of an instructional video, at least when they engage in free recall before restudying. A likely explanation is that RP revealed knowledge gaps that children could then repair during restudy.

Question Generation and Retrieval Practice – Sequencing Open and Closed Book Enhances Learning

Presenting Author: Tino Endres, University of Freiburg, Germany; **Co-Author:** Vincent Hoogerheide, Utrecht University, Netherlands; **Co-Author:** Valeria Guidi, University of Freiburg, Germany; **Co-Author:** Tamara Van Gog, Utrecht University, Netherlands; **Co-Author:** Alexander Renkl, University of Freiburg, Germany

The learning strategy of generating test questions is part of the learners' repertoires for many years. As this generative learning activity includes test questions the combination with retrieval practice demands, often addressed as testing effect, lies very close. The combination of those two effective strategies is highly promising to increase understanding as well as retention over longer periods of time. Unfortunately, recent studies did not find those expected differences between generating test questions with or without retrieval demands. This might be because question generation and answering require different learning conditions to unfold completely. In this study, we focused on sequencing open and closed book implementation to provide the best conditions for both processes. In a mixed-between-within-design ($n=85$) we varied whether learners generated and answered questions in either open book, closed book or in a sequenced condition: question generation in open book and answering their own questions with a closed book (no text available). We further varied whether participants did this for a complex or an easier text passage and whether the assessment was immediate or one week delayed. Results showed that the availability of the text while question generation did immediately increase test performance. The open book and sequenced condition outperformed the closed book condition in the immediate posttest. In the delayed posttest the sequenced condition outperformed the open and closed book condition. These results show that a sequenced implementation of question generation leads to the best learning results.

Generating Answers to Prequestions Supplements the Benefits of Retrieval Practice

Presenting Author: Shana Carpenter, Iowa State University, United States

Much research has shown that practicing to retrieve information enhances learning. In nearly all of the studies on retrieval practice, students retrieve information after they have been introduced to that information via a lecture or reading assignment. Very little is known about the effects of asking students to generate

answers to questions *before* they learn something. In a series of laboratory- and classroom-based studies, college students were given "prequestions" over information they were about to learn, and their learning of the material was later assessed. Results reveal that prequestions can enhance learning and boost the effects of retrieval practice, and including daily doses of these questions as part of class activities significantly enhances student achievement.

Retrieval Practice Before Generative Learning Exceeds Generative Learning Before Retrieval Practice

Presenting Author:Linda Froese, Ruhr University Bochum, Germany; **Co-Author:**Rebecca Krebs, Ruhr-University Bochum, Germany; **Co-Author:**Jasmin Moning, Ruhr University Bochum, Germany; **Co-Author:**Niklas Obergassel, Ruhr University Bochum, Germany; **Co-Author:**Julia Waldeyer, Ruhr-University Bochum, Germany; **Co-Author:**Julian Roelle, Ruhr University Bochum, Germany

Both engaging in generative learning activities and engaging in retrieval practice can substantially foster learning. In view of the fact that these activities serve different functions (generative learning: increasing the coherence and integration of learners' mental representations; retrieval practice: consolidating memory), theories of knowledge acquisition pose that learners should be engaged in both types of activities. It is unclear, however, whether the sequence of these activities matters. A major advantage of engaging in generative learning first could be that the to-be-learned knowledge is consolidated through retrieval practice only after learners have engaged in integrating the knowledge in coherent mental representations. Hence, in comparison to a retrieval-practice-before-generative-learning sequence, mental representations of higher quality would be consolidated. By contrast, a major advantage of engaging in retrieval practice first could be that the available cognitive capacity for generative learning might be increased. When the to-be-learned basic knowledge is already consolidated, learners should be able to easily retrieve the idea units that need to be related during generative learning from memory, and thus would likely need to devote relatively low cognitive capacity to holding the idea units in working memory. This, in turn, could increase the quality of the generative activities and thus enhance learning outcomes. To address these potential differences, we varied the sequence of generative learning and retrieval practice after an initial study phase. As main results, we found that the retrieval-practice-before-generative-learning sequence yielded better retention and led to lower cognitive load during both types of activities than the generative-learning-before-retrieval-practice sequence.

Session M 4

25 August 2021 12:00 - 13:00

Session Room 9

Symposium

Assessment and Evaluation

Looking for growth: Modeling Learning Progress Data

Keywords: Achievement, Assessment Methods and Tools, Mathematics, Psychometrics, Quantitative Methods, Reading Comprehension

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Boris Forthmann, University of Münster, Germany

Organiser: Natalie Foerster, University of Münster, Germany

Organiser: Boris Forthmann, University of Münster, Germany

Organiser: Elmar Souvignier, University of Muenster, Germany

Discussant: Denis Dumas, United States

As one aspect of the digitalization of classrooms, computerized assessment systems are becoming more and more available in everyday teaching. This provides teachers with new opportunities for using formative assessments to monitor students' learning progress and to adapt instruction to students' individual needs. However, only if data are presented in a meaningful way and are easy to interpret, will teachers be able to use assessment data to make instructional decisions. This symposium brings together four European research groups to present their ongoing work on computer-based assessments. The focus is on the question of how longitudinal assessment data (i.e., learning progress data) can be modeled to facilitate meaningful conclusions about student learning. The first contribution presents findings on the equivalence of test booklets and proposes a graphical solution to present normed scores for learning progress in mathematics. The second presentation describes an extension of the Rasch model for binary test data, in which a smooth spline function represents average growth in the reference population. An application of a continuous nonparametric norming approach to longitudinal data, in which scale scores are modeled as a function of percentiles and an explanatory variable, is presented in the third contribution. The last presentation will focus on dynamic measurement models, which allow the explicit modeling of students' capacity for learning, which has been found to be particularly predictive of future learning. This symposium aims at discussing new modeling approaches both against the background of psychometric considerations and the teacher and student perspective.

Negligible booklet effects and graphical progress norms for CBM of arithmetic abilities

Presenting Author:Christin Schwenk, TU Dortmund University, Germany; **Co-Author:**Sarah Chromik, TU Dortmund University, Germany; **Co-Author:**Philipp Doebler, TU Dortmund University, Germany; **Co-Author:**Tobias Kuhn, TU Dortmund University, Germany

Curriculum-based measurement (CBM) instruments should be psychometrically sound as well as easy to interpret to be useful for teachers in instructional decision-making. This study with $n = 108$ third and $n = 109$ fourth graders (regular instruction) covers both aspects: Psychometrics and practicability. Every second week, students completed one of ten parallel test booklets of a grade-specific German math CBM, with each test form containing 24 arithmetic tasks (LVD-M 2-4; Strathmann & Klauer, 2012). Analyses with (generalized) linear mixed models showed that in both grades, the between-booklet variance was so small in relation to the between student variance to be practically irrelevant. This corresponds to the key assumption of the binomial model that equivalent scores from different booklets should represent the same ability level. While item difficulty varied across time within some of the tasks, the effect was inessential in comparison with the variance between students. The parallel booklets can therefore be regarded as equivalent for typical applied purposes. In a practical sense, this study addresses the dilemma of meaningful population norms for learning progress (*slopes*). Given that individual slopes are not independent of the general achievement level (*intercept*), no universal approach to slope standardization lies at hand. Based on smoothing, we propose a graphical solution for conditional slope norms which include markers for (realistic and ambitious) goal setting.

Modeling a smooth learning trajectory and testing individual deviations from the global trajectory

Presenting Author:Gesa Brunn, TU Dortmund University, Germany; **Co-Author:**Fritjof Freise, Stiftung Tierärztliche Hochschule Hannover, Germany; **Co-Author:**Philipp Doebler, TU Dortmund University, Germany

Formative assessment supplies valuable feedback for teachers and learners, and has been facilitated by computerized implementations. While longitudinal within student assessment or within class comparisons are useful, a normative interpretation of an individual's course of learning can only be given relative to a reference population. As current computerized assessment systems sample items from pools or adapt tests, monitored students might work on non-overlapping item sets, so that classic sum scores cannot be compared directly. To meet this challenge, the Smooth Growth and Linear Deviations Rasch Model (SGLDRM) is introduced, an extension of Rasch's Item Response Theory Model for binary test data. With the help of spline functions a smooth global course of learning is included. The model is flexible enough to accommodate increases and/or decreases of the mean ability level, which might be more or less pronounced at each measurement occasions. On the individual level, a random slope and a random intercept with amenable interpretations modify the global course of learning. Two measurement occasions suffice to estimate person specific courses. A likelihood ratio test allows to identify students whose performance differs from the mean course. The methodology is illustrated with data from an online dyscalculia assessment and training.

Continuous Norming of Learning Progress Assessments in Reading

Presenting Author:Natalie Foerster, University of Münster, Germany; **Co-Author:**Boris Forthmann, University of Münster, Germany; **Co-Author:**Elmar Souvignier, University of Muenster, Germany

Teachers increasingly use learning progress assessments (LPA) to adapt instruction to students' needs based on data, and to evaluate their instructional modifications. In this vein, it is important to provide teachers with an accurate and meaningful frame of reference against which students' learning progress can be interpreted and used for instructional decision-making. Lenhard et al. (2016) proposed to use continuous norming to counteract classical norming problems

such as discontinuities or low measurement precision for extreme values. The continuous norming method generates continuous test norms by modeling scale scores as a function of percentiles and an explanatory variable (e.g., age). In this study, we present an application of this continuous norming approach to LPA in reading using the quop-L2 test series (Förster & Kuhn, 2020) and longitudinal data of $N = 10,436$ students across eight points of measurement. quop-L2 was designed to assess the efficiency of component processes of reading comprehension at the word, sentence, and text levels. Analyses with the R package cNORM (Lenhard et al., 2018) revealed appropriate regression models for all three subscales. Both statistical and graphical models showed that the specific norm curves varied across measurement time points as a function of ability. The norm curves suggest that student reading progress was weakest at the word scale and strongest at the text scale. Moreover, for the highest-performing students, a learning plateau was evident after the sixths point of measurement. We discuss the usefulness of the continuous norming approach for LPA.

Using learning progress assessment data to estimate learning capacity

Presenting Author: Christoph Weber, University of Education Upper Austria, Austria; **Co-Author:** Christoph Helm, Johannes Kepler University Linz, Austria; **Co-Author:** David Kemethofer, Institute of Education and Psychology, Austria

The recently developed dynamic measurement modeling (DMM) approach allows for estimating student's learning capacity, technically defined as the upper asymptote of a monotonically increasing and decelerating growth function. In this study, we investigate whether the DMM approach is applicable to learning progress assessment (LPA) data that provide information on repeated measures of achievement during a single school year. Specifically, we use data from 518 Austrian first graders who took eight LPA word reading tests during their first year of primary school. The results show that the DMM can be fitted to the LPA data. Contrary to expectations, however, the estimated capacity scores do not improve the prediction of future reading performance compared to single LPA-test scores. We discuss implications for the further evaluation of the suitability of the DMM approach for LPA data.

Session M 5

25 August 2021 12:00 - 13:00

Session Room 10

Symposium

Cognitive Science, Learning and Instructional Technology

Interdisciplinary collaborations to improve early learning via evidence-based preschool curricula

Keywords: At-risk Students, Cognitive Development, Early Childhood Education, Educational Policy, Game-based Learning, Interdisciplinary, Mathematics, Neuroscience, Self-regulation

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 22 - Neuroscience and Education

Chairperson: Eric Pakulak, Stockholm University, Sweden

Discussant: Courtney Stevens, United States

Our understanding of early developmental factors that predict later learning and academic outcomes, and our ability to target these factors via evidence-based curricula, has increased dramatically in the past several decades. This has been driven in large part by interdisciplinary efforts that combine evidence from multiple fields, primarily developmental science and educational science, and has highlighted the potential to improve early learning and school readiness via preschool curricula that target learning across multiple domains and via multiple pathways, and that are developed in close collaboration with local stakeholders. For progress to continue, it is crucial to move toward approaches that are more tailored to individual, group, and cultural differences, which in turn requires an expansion of the breadth of interdisciplinary and cross-cultural collaboration. The symposium aim is thus an interactive discussion of how we can improve early learning outcomes for children via broader interdisciplinary and cross-cultural collaborations. This discussion will be guided by presentations from interdisciplinary lines of research in four different cultural contexts that target early learning via approaches developed in collaboration across multiple disciplines and with local stakeholders, but with unique cultural considerations and different approaches to consider the specificity of effects for individuals and groups. Central to scientific relevance, each line of research contributes unique evidence concerning potential risk factors and mechanisms of change in preschool curricula. Central to educational relevance is the discussion of pathways to increase interdisciplinary and cross-cultural collaborations that can use this evidence to improve educational outcomes and add to this evidence.

Interdisciplinary development of a two-generation preschool curriculum for at-risk children

Presenting Author: Eric Pakulak, Stockholm University, Sweden

Previously, we developed a two-generation intervention that targets stress, attention and self-regulation in preschool children from lower socioeconomic status (SES) environments by engaging the broader context of parents and the home environment and demonstrated positive effects on parents and children (Neville et al., 2013). The aims of the current study were to integrate this intervention into the preschool environment, and to test the degree to which a model of the intervention featuring increased integration between the classroom and home environment would impact our hypothesized mechanisms of change, neurobiological systems important for stress regulation and selective attention in children and parents. Children from lower SES environments in 20 classrooms across nine sites were randomly assigned to receive either the intervention or a business-as-usual comparison condition, with a comprehensive battery of assessment data including measures of physiological and neurophysiological regulatory systems in both children and parents acquired for each annual cohort in fall and spring of the school year. We are testing the hypothesis that that an integrated two-generation intervention with increased consistency between the classroom and home environment will reduce stress and improve self-regulation in both children and parents in lower SES environments.

Interdisciplinary approaches to tailored intervention and risk assessment

Presenting Author: Sebastian Lipina, CEMIC-CONICET, Argentina

Between 2002 and 2018, the Unit of Applied Neurobiology designed and implemented a series of interventions targeting early learning in preschool-aged children from lower socioeconomic status (SES) homes in Argentina. These interventions were delivered via collaborations with local schools and community childcare centers, involved a range of delivery models, and were tested in quasi-experimental studies. Results showed improvements on multiple aspects of self-regulation including brain function and transfer effects on classroom self-regulatory behavior and academic performance, and also revealed individual profiles of modulation. Based on these results and in collaboration with experts from multiple disciplines, we developed a calculation system that creates individualized risk profiles based on multiple levels of analysis and that can be used to inform a tailored course of action for children and caregivers. Results from these studies illustrate the great potential to more specifically tailor educational approaches for children at risk for developmental delays, in particular for regulatory systems important for early learning, via interventions that combine multiple pedagogical approaches and a consideration of multiple levels of analysis.

Interdisciplinary Collaboration in the Agder Project

Presenting Author: Ingunn Størksen, University of Stavanger, Norway

The Norwegian Early Childhood Education and Care (ECEC) system is often praised for its universal framing, subsidized enrollment for children aged 1 – 5 years, and focus on children's play. Yet, recent research has revealed several weaknesses with this system, e.g. when it comes to preparing children for school. A Norwegian research team conducted the Agder Project as a collaborative effort between ECEC teachers, child psychologist and economists as a contribution to give children a more equal starting point before school. International researchers have contributed throughout the project. The aim of the project was to develop and scientifically test a playful learning preschool program aimed at early language, math, executive functioning (self-regulation), and social competence. Interdisciplinary and cross-national collaboration was emphasized. The intervention was developed in a co-production process between ECEC teachers and researchers, and child outcomes in the intervention were compared to the outcomes in the control group through a classical Randomized Controlled Trial (RCT) design. The RCT included 691 five-year-olds in 71 preschools. Measures assessed children's early math, language, and executive functioning. The nine-month intervention gave effects on child development at post-intervention and the effects persisted one year following the end of the treatment. The effects were mainly driven by the preschool centers identified as low-quality at baseline, suggesting that the intervention may reduce inequality in

early childhood learning environments. Interdisciplinary and international collaboration contributed to the development, implementation, and results in the Agder project.

DigiTaktik: A Digital Tool for Learning and Formative Feedback in the Context of Early Math

Presenting Author:Susanne Kjällander, Stockholm University, Sweden; **Co-Author:**Sofia Frankenberg, Stockholm University, Sweden; **Co-Author:**Agneta Gulz, Lund University, Sweden; **Co-Author:**Magnus Haake, Lund University, Sweden; **Co-Author:**Eric Pakulak, Stockholm University, Sweden

The difference in knowledge level between children is increasing. Research shows large differences in early mathematics, even before school starts. In a network of researchers and early childhood educators, educators asked for better tools for strengthening children's individual potential in the context of preschool group-oriented learning practices. DigiTaktik is an intervention that further develops a digital mathematics game and adds an educator-designed tool for preschool teachers to work with the national curriculum to support children's learning. DigiTaktik was developed in close collaboration with preschool educators and researchers from developmental cognitive (neuro)science, and child- and youth studies in a series of workshops. DigiTaktik includes a training package on early mathematics and self-regulation. The results of a five-week pilot study showed that DigiTaktik can be implemented with fidelity by an independent group of preschool educators, and we are currently further assessing the intervention in a randomized controlled trial feasibility study in which 23 preschools (450 children) randomly assigned at the school level to DigiTaktik or an active or passive comparison condition. The methodology was adjusted due to the pandemic and implemented digitally. We hypothesize that DigiTaktik will develop child early math skills more rapidly and also positively impact teacher attitudes about teaching early math. If our hypotheses are upheld, this would suggest that programs such as DigiTaktik, that take an interdisciplinary and collaborative approach to building innovative tools for preschool, represent a promising direction in efforts to equalize early math learning possibilities for all children, in particular those from different socioeconomic backgrounds.

Session M 6

25 August 2021 12:00 - 13:00

Session Room 17

Symposium

Higher Education, Instructional Design, Learning and Instructional Technology

Reading Processes in Task-Oriented Reading: Relevance of Strategies and Reading Patterns

Keywords: Collaborative Learning, Comprehension of Text and Graphics, Higher Education, Metacognition, Primary Education, Reading Comprehension, Secondary Education, Self-regulation

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 16 - Metacognition

Chairperson: Amos van Gelderen, Netherlands

Organiser: Mariska Okkinga, Rotterdam University of Applied Sciences, Netherlands

Discussant: Ivar Bråten, University of Oslo, Norway

Task-oriented reading is conceptualized as an adaptive problem-solving process in which readers use parts of texts selectively based on their relevance for a specific learning task. In this process, the usage of strategies is important to lead to efficient and accurate task performance. Students, in all types of education, are confronted with learning tasks requiring consultation of written information. Many students experience difficulties in aligning the demands such tasks pose with the information contained in the texts. The four contributions in this symposium investigate how strategies and reading patterns contribute to students' task-oriented reading in different educational contexts. The first presentation evaluates the effects of a strategy-based and peer-assisted intervention program on the reading competence and the use of reading strategies of third-grade students. In the second presentation, the focus is on distinguishing macro-level reading patterns during a reading task performed by secondary education students. In the third presentation the influence of text availability and type of question in student's comprehension is examined in secondary education students. Finally, the last presentation investigates the reading process of students in higher education while they are performing a complex reading task, and whether different approaches lead to different outcomes on the reading task. Together, these studies shed light on conditions necessary to improving students' approaches to task-oriented reading.

Quantity and quality of elementary school students' strategy use in reciprocal reading groups

Presenting Author:Vanessa A. Völlinger, Justus-Liebig-Universität Giessen, Germany; **Co-Author:**Lisa-Kristin Münker, Justus-Liebig-University of Giessen, Germany

The goal of this research was to evaluate the effects of a strategy-based and peer-assisted intervention program on the reading competence and the use of reading strategies of third-grade students. Twenty one 3rd grade classes were randomly assigned to the intervention group (11 classes) and to the wait list control group (10 classes). In the reading intervention students were instructed in fluent and strategic reading by trained research assistants in whole class settings and worked together with peers in reading groups. To assess the quantity and quality of reading strategy use the students' with parental consent ($N = 269$) were videotaped during a group task. The students were instructed to read and understand the text together and then individually complete a quiz on the text content. The videotaped sessions were coded by two independent coders. 30 % of the material was coded by both coders to check for interrater reliability of the coding. Initial analyses revealed that for a large proportion of students, the use of reading strategies was not the routine of choice when working together on a text. Comparing intervention and control group students, results show, that while there was no difference in the quantity of strategy use in the small groups at pretest, at posttest and follow-up test intervention students used the reading strategies questioning and predicting more often than control students. Further qualitative analyses of the video sequences are needed to explore the details of strategy use in depth in the reading groups.

Reading Strategies and Patterns during Task-Oriented Reading

Presenting Author:Jolique Kielstra, Radboud University, Netherlands; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Roel van Steensel, Erasmus University Rotterdam, Netherlands; **Co-Author:**Ludo Verhoeven, Radboud University, Netherlands

Task-oriented reading involves reading with the purpose of processing information for the execution of a specific task. Thus, students need to decide what to read and how to process the text. These decisions require students to regulate their strategy use during reading. In this study, we examined reading patterns of 44 vocational students, while they were executing a task. These tasks differ in form and complexity, resulting in differences in how students read the text accompanying the task. Logdata from students of these different reading processes was transformed into 1091 reading graphs to investigate students reading patterns from a macro-level perspective. At the same time, the occurrence of individual reading strategies, such as re-reading and number of search decisions, are also identifiable within these patterns. We found three distinguishable macro-level reading patterns, a search reading pattern, a targeted reading pattern and an intensive reading pattern. This provides insight into how students reading process differs while they are executing tasks, which can be used for future feedback purposes.

The effects of text availability and question type in task-oriented reading of multiple documents

Presenting Author:Raquel Cerdan, University of Valencia, Spain; **Co-Author:**Ignacio Manez, University of Valencia, Spain; **Co-Author:**Maria-Angeles Serrano, University of Valencia, Spain

This study examines the influence of text availability and type of question in student's comprehension, the moderator effect of students' reading skill, and the mediational effect of students perceived cognitive load in the relationship between reading skill and performance outcomes. Seventy secondary school students read three expository texts and answered intra- and inter-text questions with or without the texts available. Participants performed a delayed free recall task and answered a cognitive load test in MDs. Results showed higher performance scores in the intra-text questions when the text was available than when it was not. However, the superiority of text availability disappeared in the delayed recall task. Additionally, skilled readers benefited from having the text available during the learning phase, so they recalled more ideas after a delay. Finally, results showed that having higher reading skills leads to perceiving the task as less difficult, leading to higher performance on inter-text questions.

Self-regulatory activities for task-oriented reading in higher education

Presenting Author:Mariska Okkinga, Rotterdam University of Applied Sciences, Netherlands; **Co-Author:**Amos van Gelderen, University of Amsterdam / Rotterdam University of Applied Sciences, Netherlands

Task-oriented reading is an important aspect of students' learning in higher education. In almost all disciplines students are required to use long texts in order to complete tasks aiming at the acquisition of new domain specific knowledge and insight into conceptual relations. However, many students in higher vocational education have little prior experience in this type of reading and lack strategies for executing it efficiently and effectively. This study is intended to shed light on the reading process of students while they are performing a complex reading task, in which multiple texts have to be consulted in order to answer open-ended questions, and whether different approaches lead to different performance on the reading task. In total, 105 teacher-students from different disciplines performed a complex reading task, while their activities were logged. Based on the logdata, different self-regulatory activities were extracted. The results show that initial task representation, focus on relevant texts parts and time to answer questions contribute to a better performance on the reading task. In contrast, initial reading did not contribute to the performance on the reading task. The results of this study show that the quality of students' task representation should receive more attention in the context of task oriented reading in higher education.

Session M 7

25 August 2021 12:00 - 13:00

Session Room 13

Symposium

Learning and Social Interaction

Recent Research on Classroom Disturbances

Keywords: Learning and Developmental Difficulties, Quantitative Methods, Social Aspects of Learning and Teaching, Social Interaction, Teaching/Instruction

Interest group: SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Boris Eckstein, University of Teacher Education St. Gallen, Switzerland

Organiser: Boris Eckstein, University of Teacher Education St. Gallen, Switzerland

Discussant: Reto Luder, Zurich University of Teacher Education , Switzerland

Classroom disturbances impair the quality of teaching and learning, and they can be a source of strain for both teachers and students. For teachers in particular, classroom disturbances are among the most serious occupational stress factors. Given the problem's relevance, school practice requires more evidence-based knowledge. This is a challenge for educational research, because classroom disturbances are socially co-constructed and thus many-faceted phenomena. Several methodological issues arise from this complexity, e.g. the subjectivity and context dependency of teachers' and students' perceptions, the adequacy of teachers', students' or observers' ratings, and the control of rater effects in the analyses. In the symposium, three studies are presented which address these issues by different approaches: (1) *Jansen and Decristan* explored the teachers' visual attention in relation to student behaviour using eye tracking technology. Their findings suggest that the teachers' predominant focus lies on students who are particularly engaged and on those who show actively disturbing behaviour. (2) *Wettstein and Scherzinger* compared the perspectives of students, teachers, and external observers on classroom disturbances, classroom management, and teacher-student relationship using a multi-method design. Their results indicate consistencies but also divergences, e.g. the external observations correspond better with the student ratings than with the teacher ratings. (3) *Eckstein, Grob and Reusser* investigated conditions of undisciplined student behaviours (controlling for rater effects) and of the teachers' corresponding perception of disturbance. Their findings suggest preventive effects for high quality teaching. In the symposium's conclusion, Luder discusses the studies' limits, strengths, and implications for theory, research and school practice.

Exploring teachers' visual attention on classroom disturbances and student engagement

Presenting Author:Nina C. Jansen, Bergische Universität Wuppertal - Institut für Bildungsforschung, Germany; **Co-Author:**Jasmin Decristan, University of Wuppertal; IDEA-Research Center, Germany

Classroom disturbances interrupt teaching and learning and should be managed proactively, reactively or, in the best case, preventively by competent teacher action. Thus, classroom management is regarded as a fundamental feature of effective teaching. Withiness is key to classroom management and the omnipresent attention of a teacher should contribute to the prevention of classroom disturbances. Withiness presupposes varying attention distribution by teachers depending on changing teaching-learning contexts. In classes with frequently occurring classroom disturbances evenly scattered attention is required to prevent disturbances before they are occurring, whereas highly engaged students demand more focussed attention in selective interaction processes. Based on these assumptions, this pilot study examines teachers' visual attention and connects it to different student behaviour in class. Mobile eye tracking was used to capture teacher attention in class. Student behaviour was assessed via video-based ratings. The ratings focussed on active and passive classroom disturbances as well as on engagement of n = 26 students within an interval of 10 minutes in each of the 5 classes. The findings suggest that teachers distribute their attention asymmetrically among the students in their class with particularly engaged as well as actively disturbing behaviour receiving more attention. Surprisingly, teachers do not state that students with actively disturbing behaviour require an increased amount of attention. Further exploration of students' behaviour and teachers' perceptive processes will help to clarify this unexpected finding.

Classroom Disturbances from the Perspective of Teachers, Students, and External Observers

Presenting Author:Marion Scherzinger, PHBern, Switzerland; **Co-Author:**Alexander Wettstein, PHBern / University of Bern, Switzerland

The present paper focuses on the convergences and divergences of different views of classroom processes. Questionnaire and video-based observation were used in fifth- and sixth-grade classrooms in Switzerland to examine how all the three of teachers, students, and external observers perceive classroom disturbance, the teacher-student relationship, and classroom management. The results of the questionnaire show that the students of a class agreed to a certain extent in their ratings of classroom disturbances, the teacher-student relationship, and classroom management. Conversely, the agreement between students' and teachers' ratings vary. Specifically, on classroom disturbances their agreement is weak to moderate, on the teacher-student relationship their agreement is weak, while there is no accordance on classroom management. Video-based observation shows a moderate agreement between the ratings of external observers and students but only weak correspondence between external observers and teachers. Accordingly, external observers' low-inference observations correspond far better with the ratings of students than the ones of teachers. Each of the three perspectives has specific methodological and theoretical advantages and disadvantages. It is crucial to understand their convergences and divergences in order to create better learning environments.

Conditions of Classroom Disturbances

Presenting Author:Boris Eckstein, University of Teacher Education St. Gallen, Switzerland; **Co-Author:**Urs W. Grob, University of Zurich, Switzerland; **Co-Author:**Kurt Reusser, University of Zurich, Switzerland

Classroom disturbances impair the quality of teaching and learning and they can become a strain for both teachers and students. Given this relevance, school practice requires more evidence based knowledge on preventive conditions of classroom disturbances. However, previous research of these conditions did not always sufficiently account for the co-constructive nature of classroom disturbances; especially the subjectiveness and context dependency of the perception of disturbance (rater effects) were often neglected. This is where the SUGUS study comes in. We conducted a survey among 85 teachers and their 1'687 students ($M=11.7$ years) with two core themes: the frequency of deviant behaviours shown by particular target students; the intensity of disturbance caused by these targets as subjectively perceived by the respondents. In addition, personal traits of the respondents (e.g. general sensitivity to disturbances) and contextual traits (e.g. teaching practices) were assessed. The data were analysed by means of a structural equation model with two dependent variables (targets' deviant behaviours [modelled as latent trait-variable adjusted for rater effects]; teachers' target-specific perception of disturbance) and six predictors (traits of teaching practice; teachers' and targets' personal traits). The findings indicate that lower frequencies of undisciplined behaviours coincide with higher degrees of motivational support, and contentual structuredness in teaching. Furthermore, the results suggest that the teachers' target-specific perception of disturbance is affected by their general sensitivity and by the social form practiced in teaching – independent of the targets' actual behaviour. The findings' implications for

school practice will be discussed considering limits of the study.

Session M 8

25 August 2021 12:00 - 13:00

Session Room 5

Symposium

Learning and Social Interaction

Analysing Educational Dialogues: Integrative and Critical Perspectives

Keywords: Argumentation, Collaborative Learning, Conversation/Discourse Analysis, Emotion and Affect, Mixed-method Research, Qualitative Methods, Social Interaction, Synergies between Learning; Teaching and Research, Teaching/Instruction, Values Education, Video Analysis

Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Fiona Maine, University of Cambridge, United Kingdom

Organiser: Michael Baker, France

Organiser: Baruch Schwarz, Hebrew University of Jerusalem, Israel

Discussant: Sten Ludvigsen, University of Oslo, Norway

In the wake of Sinclair and Coulthard's (1976) seminal work, research on analysing educational dialogues has now reached a certain degree of maturity, as revealed by four main developments. Firstly, global approaches to promoting educational dialogue, such as "Accountable Talk®" (Michaels et al., 2008), as well as comprehensive analytical and professional development models, such the "Scheme for Educational Dialogue Analysis" (Hennessy et al., 2016), have now been developed. Secondly, analytical models have been developed for specific genres, such as argumentative interactions (Weinberger & Fischer, 2006; Baker et al., 2007). Thirdly, dimensions of analysis have been extended beyond the cognitive and linguistic, to embrace the social and the affective (Baker, Andriessen & Järvälä, 2013). Finally, research has gone beyond its comfort zone of well-formalised teaching domains, to take into consideration culture, citizenship and values. It is therefore an appropriate time for addressing the theoretical and methodological issues that have arisen from the consolidation and extension of the field of educational dialogue research, many of which, are rarely made explicit in publications (cf. Hennessy, Howe, Mercer & Vrikki, 2020). The issues to be addressed include multiple dimensions and modalities of interaction integrating cognitive and linguistic models, granularity and scope of coding schemes, problems of validation and complexity, analysing over different timescales (Ludvigsen, Rasmussen, Krane, Moen & Middleton, 2011), dealing with the implicit and the non-verbal.

A critical perspective on coding methodologies for analysing teacher-student dialogue

Presenting Author:Sara Hennessy, University of Cambridge, United Kingdom; **Co-Author:**Maria Vrikki, University of Cyprus, Cyprus; **Co-Author:**Christine Howe, University of Cambridge, United Kingdom; **Co-Author:**Neil Mercer, University of Cambridge, United Kingdom

The growing research literature on features of classroom talk considered productive for learning creates the need to evaluate the methodological issues and challenges arising. A common approach involves recording, transcribing and coding dialogue for productive features. This paper discusses a multi-layered approach to analysis using a recent large-scale project conducted in primary schools in England. While multilevel modelling showed that learning outcomes in English and mathematics were related to natural variation in use of dialogic teaching, a follow-up study analysed the emerging productive forms of dialogue in more depth. The paper also discusses emerging methodological issues and complementary methods for expanding the study of lesson characteristics associated with higher learning gains. The paper makes a methodological contribution to the field by shedding light on the complexities of micro-coding classroom talk and sets the foundation for discussion to help progress the field. Implications for guiding practitioners to attend to classroom interactions will be discussed.

Emotions in Collaborative Learning – Process-orientation and multimodalities in video-observation

Presenting Author:Piia Naykki, University of Jyväskylä, Finland; **Co-Author:**Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:**Sanna Järvälä, University of Oulu, Finland

The aim of this paper is to discuss methodological advantages and challenges in exploring emotions in collaborative learning interactions. Lately, multimodal approaches have provided complementary data channels to support micro-level video analysis of verbal interactions. This paper introduces two empirical studies as examples of process-oriented research and multimodal approach in video-observation. With the case examples we will discuss what kind of information of emotions in collaborative learning interaction can be captured with video data. We will illustrate how video data can be complemented with other data sources on the aspects that video data miss out, such as situational physiological reactions and group members' own interpretations of their learning and collaboration. We discuss what are the future possibilities and challenges with video data implementation in the process-oriented collaborative learning research.

Affective Dialoguing: Socio-Cognitivo-Emotional Natures of Collaboration in Educational Interactions

Presenting Author:Claire Polo, ECP Laboratory, France; **Co-Author:**Kristine Lund, CNRS & Ecole Normale Supérieure de Lyon, France

Seven years ago, Baker; Andriessen, & Järvälä edited *Affective Learning Together* (2013), a book gathering several empirical studies and pointing out the so far underestimated social and emotional dimensions of learning. This publication illustrates a recent, though quite general consensus in today's educational sciences consisting in seeing learning as a tripod process involving cognitive, social and affective aspects. Nevertheless, to date, very little research has actually apprehended educational dialogue taking into account these three dimensions all together. Many studies rather insist on the socio-cognitive side of educational processes, or on the socio-emotional one. We believe that this is due to a lingering remnant of the old Western reason/emotion dichotomy in the usual theoretical and methodological approaches undertaken to analyze educational dialogue. In this paper, we propose conceptual constructs to overcome such dichotomy and draw methodological implications of this integrative theory of learning as a socio-cognitivo-emotional process. Indeed, the very complex, tridimensional nature of educational dialogue requires the researcher to follow 2 key analytical principles while interpreting the data: 1) address both the cognitive and the metacognitive level of the interaction, 2) respect the nature of human communication. We provide three very simple cases to illustrate how our argument applies to authentic dialogues important for education.

Methodological challenges in analysing values in students' interactions

Presenting Author:Gabriel Pallarés, CNRS - i3 - Telecom ParisTech, France; **Co-Author:**Talli Cedar, The Hebrew University of Jerusalem, Israel; **Co-Author:**Michael Baker, CNRS - Telecom Paris Tech, France; **Co-Author:**Françoise Détienne, CNRS - Telecom ParisTech, France; **Co-Author:**Lucas Bietti, Department of Psychology, NTNU, Norway; **Co-Author:**Baruch Schwarz, Hebrew University of Jerusalem, Israel

The development of students' values in the context of social interaction with peers and teachers has as yet been rarely considered in educational research, most research on moral development having focused on responses to classical moral dilemmas. We investigate students' conceptions of tolerance, empathy and inclusion, as they evolve in their interactions, as part of a large EU H2020 project on dialogue and argumentation on European values. The data analysed involves students interacting, with teacher guidance, around wordless texts and videos that invite the construction of narratives and discussion of ethical questions arising from them. We present a framework for systematic analysis of the microgenesis of student's understandings of values, in their social interactions, on two related levels. Values shape mutual understanding and the co-elaboration of meanings about the topics being discussed in dialogues (i.e. empathy towards the main character of the story) as well as the ways in which these collaborative processes unfold over time (e.g. empathy towards fellow students during the interaction). We discuss three attendant and interrelated methodological issues: (1) identifying clear frames of reference for analysis of values enacted in *hic et nunc* dialogues; (2) how to analyse values on the level of the implicit, locally or globally 'underlying' the students' dialogue; and (3) difficulties in validating analyses of values systems underlying students' dialogues.

Session M 9

25 August 2021 12:00 - 13:00

Session Room 12

Symposium

Learning and Special Education

The classroom as a stimulating context for students' cognitive development

Keywords: Cognitive Development, Early Childhood Education, Secondary Education, Self-regulation, Student Learning, Teaching Approaches, Teaching/Instruction

Interest group:

Chairperson: Dieter Baeyens, KU LEUVEN, Belgium

Discussant: Petra Warreyn, Ghent University, Belgium

Adequate school functioning and successful academic performance require well-developed self-regulation (SR) skills, the cognitive processes needed to regulate behavior, thoughts and emotions (Diamond, 2013), also referred to as executive functions (EF). SR development depends on brain maturation as well as environmental stimulation (Anderson, Jacobs & Anderson, 2008). Literature suggests that classroom environment, especially teacher-students interactions (TSI), can have a profound impact on SR (Downer, Sabol & Hamre, 2010; Vandenbroucke et al., 2017). Current knowledge on the TSI-SR relationship is primarily built on primary school samples, and generally of correlational nature. This symposium aims to shed more light on these associations, by taking two different approaches. First, we focus on toddlers (contributions 1 and 2). As toddlers receive their first formal schooling, studying this group can help unravel the development, nature, and direction of the TSI-SR association. Second, investigating the direction of the TSI-SR association requires experimental manipulation, which is often not feasible in real life. In this symposium, a virtual reality study (contribution 3) shows proof-of-concept for a new way to manipulate these contextual parameters. In addition, the current symposium focuses both on TSI domains on the dyadic (closeness, conflict and autonomy; contribution 2) and classroom level (emotional, organizational and behavioral support; contributions 1 and 3), while the majority of available studies use a more restrictive attachment-based perspective. As such, the current symposium will advance our understanding of how and to what extent teachers can promote the cognitive processes that are essential in children's learning.

The Role of Teacher-Child Interactions on Executive Function Development in Toddlerhood

Presenting Author:Sümeyye Koşkulu, Utrecht University, Netherlands; **Co-Author:**Hanna Mulder, Utrecht University, Netherlands; **Co-Author:**Eva van de Weijer-Bergsma, Utrecht University, Netherlands; **Co-Author:**Elma Blom, University Utrecht, Netherlands

Although the effect of teacher behaviors on executive function (EF) development has been studied in children aged four years and older, it is largely unknown for early childhood (i.e., before the age of four). We examined how the quality of teacher-child interactions is related to EF development of children in toddlerhood. A sample of 876 children and 215 teachers participated in a two wave study. At first and second wave, the children were respectively 2 and 3 years old. Emotional, Behavioral, and Instructional Support of teachers were observed at the first wave using the Toddler version of the Classroom Assessment Scoring System (La Paro et al., 2014). EF performances of children were assessed at both waves through an EF battery adopted for toddlers. Results revealed that, controlling for child characteristics and demographics, Instructional Support of teachers positively predicted the change in EF scores of toddlers from age 2 to 3. Emotional and Behavioral Support of teachers were not related to EF change. This study contributes to the emerging evidence that teachers' instructional support is important for EF improvement of toddlers and suggests implications for the classroom settings to optimize the learning environment in early childhood education.

Teacher-child relationships and self-regulation: The role of closeness and autonomy support

Presenting Author:Joana Cadima, University of Porto, Portugal; **Co-Author:**Carolina Guedes, University of Porto, Portugal; **Co-Author:**Tiago Ferreira, University of Porto, Portugal

In the present study, we examined the associations between teacher-child relationships and child self-regulation in toddler classrooms. Participants were 226 toddlers (51% boys; M = 2 years and 11 months, SD = 4.04 months) and 37 educators in Portuguese classrooms. Direct assessments of self-regulation were conducted during spring (T1) and fall (T2). Teachers reported on levels of teacher-child closeness, conflict, and autonomy support in fall. A series of analyses were conducted to test the influences of teacher-child relationship quality on child self-regulation. Results showed that closeness and autonomy support were significantly associated with self-regulation at T2, controlling for earlier self-regulation skills, whereas no associations were found for conflict. In addition, initial levels of self-regulation (T1) were positively associated with both closeness and teacher autonomy support. Our findings suggest the importance of positive and autonomy supportive relationships for self-regulation.

Myth or truth – Does sitting close to the teacher support students' learning and self-regulation?

Presenting Author:Friederike Blume, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Ann-Christine Ehlis, University of Tübingen, Germany; **Co-Author:**Annette Conzelmann, University of Tübingen, Germany; **Co-Author:**Caterina Gawrilow, University of Tübingen, Germany

Students with self-regulation difficulties are at risk for academic impairment. To mitigate negative outcomes, teachers adjust their teaching. For instance, teachers assign students seats nearby them. However, it was unclear whether sitting nearby the teacher actually improves students' learning and whether these seats actually benefit students' momentary self-regulation, which was investigated in two studies utilising virtual reality classrooms. In both studies, students were randomly assigned to either sit nearby or distant to the teacher. In Study A, 81 adolescents attended a virtual math lesson after which their learning was assessed. In Study B, 42 adolescents completed a Go/NoGo task and their electroencephalogram was recorded in parallel. In both studies, parents reported on their child's self-regulation. Study A demonstrated that students learned better sitting proximally than distantly to the teacher. Additionally, higher self-regulation deficits impaired learning more. Sitting proximally was not additionally beneficial at increasing self-regulation difficulties. Study B found no differences in attention and response inhibition performance between seats. The Go-P300 amplitude reflecting a neurophysiological attention index was found to be related to students' self-regulation only proximally to the teacher. The finding that students learned better sitting proximally indicates that teachers' presence should be distributed equally to foster learning equally. However, as sitting proximally did not contribute to further improved learning at increasing self-regulation difficulties, further intervention measures are required. Since students' momentary attention was related to their self-regulation only proximally to the teacher, these measures might be particularly relevant when students sit close to the teacher.

Session M 10

25 August 2021 12:00 - 13:00

Session Room 2

Symposium

Learning and Social Interaction

Understanding and promoting students' oral participation in class

Keywords: Achievement, Cooperative/Collaborative Learning, Educational Psychology, Experimental Studies, Higher Education, Motivation, Quantitative Methods, Secondary Education, Social Aspects of Learning and Teaching, Social Interaction, Student Learning, Teaching Approaches, Teaching/Instruction, Video Analysis

Interest group: SIG 04 - Higher Education, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Susanne Jurkowski, Universität Erfurt, Germany

Organiser: Lukas Mundelsee, University of Erfurt, Germany

Discussant: Christine Pauli, University of Fribourg, Switzerland

Students with higher levels of engagement in classrooms not only learn more, but they are also more successful in the long run (Finn & Zimmer, 2012).

Students' oral participation as one specific form of classroom engagement is the focus of this symposium. Activities such as responding to teachers' questions,

contributing to classroom discussions, and other forms of oral participation fulfill crucial functions for classroom learning (for a review see Rocca, 2010): First, by engaging in classroom discourse students can elaborate on their ideas enhancing learning. Second, in contrast to other forms of classroom engagement, oral participation is directly observable, providing teachers with insights into their students' learning progress. In consequence, teachers can react to their students, e.g., by praising accomplishments or revising errors. These student-teacher interactions make oral participation an important precursor to higher-order learning. This symposium strives to advance the knowledge on underlying mechanisms and conditions, under which students do or do not participate orally. First, we focus on intraindividual processes underlying oral participation (Sedova & Sedlacek; Böheim et al.), followed by contributions focusing on characteristics of the learning context influencing oral participation (Fischer & Hänze; Mundelsee & Jurkowski). References
Finn, J. D., & Zimmer, K. S. (2012). Student engagement: What is it? Why does it matter? In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.) *Handbook of research on student engagement* (pp. 97-131). New York, NY: Springer.
Rocca, K. A. (2010). Student participation in the college classroom: An extended multidisciplinary literature review. *Communication Education*, 59, 185-213.

Effects on collaboration on students' hand raising

Presenting Author:Lukas Mundelsee, University of Erfurt, Germany; **Co-Author:**Susanne Jurkowski, Universität Erfurt, Germany

Think-Pair-Share (TPS) is a teaching strategy thought to increase oral participation, in particular in shy students. After thinking for themselves, students talk to their seatmate to exchange their ideas and finally show their willingness to participate orally by raising their hand. In the present field study, we tested TPS with 393 ninth-grade students against two variations, Think-Share (TS; first think, then raise hand) and Share (S; directly raise hand). Students reported on their shyness, and, in each condition, on their hand raising, state anxiety, and motives for (non-)hand raising. Analyses revealed that TPS led to more hand raising compared to the S condition. Lower levels of hand raising in TS were fully mediated by state anxiety. Shy students reported social evaluative concerns and raised their hand less frequently than their non-shy peers, but also benefited from TPS. These results indicate the importance of peer collaboration for oral participation.

Course characteristics enhancing students' oral participation in higher education

Presenting Author:Elisabeth Fischer, University of Kassel, Germany; **Co-Author:**Martin Haenze, University of Kassel, Germany

Many teachers strive for lively student participation in class. This field study examined aspects of learning environments in higher education with regard to their effect on students' verbal engagement. Overall, six factors that might enhance students' motivation (expectancy and value) to speak up and, thus, increase oral participation were investigated: the number of teacher questions, course atmosphere, level of demand, student preparation (e.g., through homework), class size, and subject discipline. The sample consisted of 80 university courses of diverse disciplines; variables were measured by trained observers as well as by the attending students. Student oral participation was indicated by the number of student questions, the number of student contributions, and an engagement rate denoting the breadth of participation in a course. Three multiple regression analyses were conducted. They revealed a differentiated result pattern: Whereas the amount of student questions increased with the level of demand and a positive course atmosphere, the number of contributions and the breadth of participation were both closely linked to the number of teacher questions posed, but were also influenced by student preparation, level of demand, and the teaching culture of the subject discipline. Class size did not have a significant effect on any of the three participation measures.

Motivational and cognitive correlates of student hand raising

Presenting Author:Ricardo Böheim, University of Augsburg, Germany; **Co-Author:**Maximilian Knogler, Technical University of Munich (TUM), Germany; **Co-Author:**Tim Urdan, Santa Clara University, United States; **Co-Author:**Tina Seidel, Technische Universität München, Germany

Student hand raising is an everyday behavior in classroom interactions with teachers. Students who want to participate in classroom discourse and share their thoughts and ideas are commonly required to first raise their hands. Therefore, hand raising represents students' gateway to oral participation. Despite its pivotal role, student hand raising has received little research attention in recent years. In this paper, we present results from two video studies. Study 1 (397 high school students) investigates relations between hand raising and students' stable motivational orientations and situational student motivation. The results show that the distinct motivational constructs account for a significant share of variance in student hand raising. Hand raising is positively related to students' intrinsic motivation, the relation to students' external regulation of motivation is negative. Interestingly, the results show subject-specific differences: Student self-concept predicts hand raising in Mathematics, while students' situational interest predicts hand raising in Language Arts. Study 2 (266 high school students) examines the relationship between student hand raising, cognitive engagement, and academic achievement. Results reveal a positive relation between hand raising and the extent to which students are cognitively engaged with the learning content. Furthermore, student hand raising is associated with students' academic achievement at the end of the semester. We discuss the potential of hand raising to serve as a useful indicator of students' engagement during classroom discourse. Results from this research contribute to a better understanding of an everyday classroom behavior.

Student oral participation and silent behavioral engagement

Presenting Author:Klara Sedova, Masaryk University, Czech Republic; **Co-Author:**Martin Sedlacek, Masaryk University, Czech Republic

We adopted a person-oriented approach to identify patterns of how classroom talk and silent behavioral engagement is combined in students. The research was conducted on a sample of 639 ninth-grade students (32 classes). We measured the duration of classroom talk for each individual student during classes. The students also completed an inventory to determine their internal (silent) behavioral engagement. The students' achievement was measured by means of the results from standardized reading literacy tests conducted by the Czech School Inspectorate (CSI). We also inquired about the socioeconomic background of students. We identified five distinctive participation profiles and analyzed whether profile membership can predict student achievement. We found the profile with high talk and high engagement to perform best and the profile with low talk and low engagement to perform worst. Analyzing inconsistent profiles, we detected classroom talk to be the more decisive factor for student achievement than silent behavioral engagement. Our findings thus highlight the important role of classroom talk in relation to student learning.

Session M 11

25 August 2021 12:00 - 13:00

Session Room 14

Symposium

Teaching and Teacher Education

Using vignettes in Mathematics teacher education and research: The role of knowledge and beliefs

Keywords: Assessment Methods and Tools, Attitudes and Beliefs, Competencies, Mathematics, Pre-service Teacher Education, Qualitative Methods, Quantitative Methods

Interest group:

Chairperson: Karen Skilling, University of Oxford, United Kingdom

Organiser: Marita Eva Friesen, University of Education Freiburg , Germany

Discussant: Orly Buchbinder, University of New Hampshire, United States

The use of vignettes is critically important to promote prospective teachers' learning since vignettes can represent authentic classroom practice in different formats (e.g. video, cartoon, written). Complemented by purposefully designed materials and questions, vignettes can provoke value-laden beliefs or facilitate the connection of mathematics education theory with teaching practice. Also in corresponding research, vignettes are used as stimuli to elicit teachers' analysing of classroom situations and to investigate related professional knowledge and beliefs. This symposium aims at bringing together mathematics educators and researchers who use vignettes in their teacher education courses and related research. Three presentations from Spain, England and Germany explore the topic by presenting studies with a particular focus on the role of mathematics teachers' knowledge and beliefs in this context. The first study investigated how vignette-based learning environments involving hypothetical learning trajectories can support the development of pre-service teachers' corresponding noticing competence. In the second study, cartoon-written based vignettes were used in a seminar to prompt discussion and elicit beliefs and professional knowledge of

pre-service teachers about various aspects relevant to their developing practice. The third study addressed different facets of teachers' professional knowledge and investigated their role for teachers' competence in analysing vignettes focusing on the use of multiple representations. The findings of these studies come together to highlight the role of teachers' professional knowledge and beliefs when engaging in vignettes. The symposium aims to be interactive and promote discussion by encouraging, via chat function and the Mentimeter tool, real-time questions and feedback from the audience.

Vignettes as tools to enhance pre-service teachers' noticing

Presenting Author:Pedro Ivars, University of Alicante, Spain; **Co-Author:**Ceneida Fernández, University of Alicante, Spain; **Co-Author:**Salvador Llinares, University of Alicante, Spain

Becoming a teacher requires to be able to use specific content knowledge and pedagogical content knowledge to identify teaching-learning situations that are relevant for students' learning, interpret them, and decide how to respond to help students' progress in their understanding. The development of this competence, professional noticing, is linked to how teachers use theoretical knowledge in practical contexts. We are interested in designing learning environments using vignettes to support pre-service teachers' competence enhancement. In this study 85 pre-service teachers participated in a learning environment where they had to analyse three text-based vignettes, related to the part-whole meaning of fractions, using the theoretical information of a hypothetical learning trajectory. Results showed that the vignettes (that include a representation of practice, some guiding questions and the information of a hypothetical learning trajectory) helped pre-service teachers use theoretical knowledge to interpret students' understanding and to propose activities to support students' conceptual progression. These results allowed us to characterise the development of this competence through the discourse generated by pre-service teachers considering the details provided to support their interpretations.

Using vignettes to provoke pre-service teachers' beliefs about professional knowledge and practice

Presenting Author:Karen Skilling, University of Oxford, United Kingdom

The activities of many initial teacher training mathematics courses, involve inducting pre-service teachers into the theoretical and pedagogical aspects of teaching, with opportunities for critical examination and personal reflection as they learn to become teachers. Accordingly, several course sessions include discussions of learning theory, and the nature of and types of knowledge relevant to reform-orientated notions of mathematics education. This study reports on the use of image-written based vignettes which were used to prompt discussions and elicit the beliefs of pre-service teachers about various theoretical aspects relevant to their developing practice. Aspects include: transmissive and transformative teacher approaches to developing student understanding; professional teacher knowledge (content, pedagogic and pedagogic content knowledge) and cognitive engagement. The purposefully constructed vignettes were accompanied by a series of open-ended questions and delivered as part of planned seminars about these particular aspects. Although the class of 29 pre-service teachers completed the activities, only the findings of those who provided consent (n=11) are reported here. The results revealed pre-service teachers' interpretations and beliefs relevant to theoretical aspects, commentary on professional teacher knowledge and ways in which lessons may be constructed to promote student thinking.

What role do different knowledge facets play when teachers analyse mathematics classroom situations?

Presenting Author:Marita Eva Friesen, University of Education Freiburg, Germany; **Co-Author:**Sebastian Kuntze, Ludwigsburg University of Education, Germany

Using multiple representations and changing between them is at the heart of the mathematics classroom; unconnected changes can, however, be obstructive for students' learning. To support students in changing between representations, teachers have to link corresponding situation aspects in the classroom with relevant professional knowledge, a competence we describe as teachers' analysing of classroom situations. Various studies have shown that teachers' professional knowledge plays a critical role when they analyse classroom situations and that different facets of professional knowledge are drawn on to make sense of what has been observed. Empirical evidence related to different facets of such knowledge and their interplay is, however, still scarce. Based on prior research, we were hence particularly interested in investigating different facets of mathematics teachers' professional knowledge related to the use of multiple representations (content knowledge, pedagogical knowledge) on different levels of globality (situation-specific, domain-specific). To find answers to our research questions, we combined two test instruments from our prior research in the domain of learning fractions: N=298 mathematics teachers were asked to analyse six classroom situations (presented as text, video or cartoon) and additionally to complete a set of items dealing with domain-specific content knowledge. The results revealed no significant correlations between the different knowledge facets under investigation. Qualitative analyses provided additional insight that drawing on content knowledge or pedagogical knowledge was mostly mutually exclusive in the participants' written answers. Regression analysis showed that only the content-related knowledge facets were significant predictors of the participants' competence of analysing.

Session M 12

25 August 2021 12:00 - 13:00

Session Room 3

Symposium

Motivational, Social and Affective Processes

Emotional and Motivational Processes and their Role for Self-Regulation of Learning

Keywords: Cooperative/Collaborative Learning, Emotion and Affect, Higher Education, Metacognition, Motivation, Motivation and Emotion, Self-regulation, Student Learning, Teaching/Instruction, Vocational Education

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Tina Hascher, Switzerland

Chairperson: Thea Peetsma, University of Amsterdam, Netherlands

Organiser: Tina Hascher, Switzerland

Organiser: Thea Peetsma, University of Amsterdam, Netherlands

Discussant: Susan Beltman, Curtin University, Australia

Given the crucial role that emotion and motivation plays for learning in general, the importance of motivation and emotion for self-regulated learning processes has been found of specific interest for researchers and practitioners. Our symposium is based on three assumptions: (a) there is a variety of motivational and emotional experiences that serve scientific consideration; (b) motivation and emotions can be volatile and change during the time course of the self-regulated learning process; (b) understanding the development of motivation and emotions can help to understand self-regulated learning processes. The papers in this symposium address different empirical approaches that aim to understand the course of motivation and emotion in self-regulated learning processes. Together, the four studies represent up to date research of processes in motivation, emotion and self-regulation of learning. First, a group of researchers from Finland and Australia will present an intensive observation study of small groups of high school students' emotion and meta-cognitive regulation during science learning. Second, a research team from Switzerland will present an intervention-study that follows the motivational development of vocational learners over a long period of a year. Third, a research group for the Netherlands will present a study on trait and daily state data from secondary school teachers and their students on teachers' and students' stress experiences and self-regulated learning behaviors. Fourth, researchers from Germany will present a study of daily learning behavior of university students related to their hedonic and eudaimonic motives, measured during 21 days.

Interplay of affect and metacognitive regulation in collaborative science learning

Presenting Author:Tuuli Iiskala, University of Turku, Finland; **Co-Author:**Tarja Pietarinen, University of Turku, Finland; **Co-Author:**Marja Vauras, University of Turku, Finland; **Co-Author:**Simone Volet, Murdoch University, Australia

The aim of the present study is to examine the interplay between observable affect and metacognitive regulation (MR) in challenging collaborative science learning processes. Previous research indicates that affect, the positive emotional experiences in particular, is important in supporting students' engagement and achievement in collaborative learning. Correspondingly, especially good-outcome groups have been shown to successfully utilize MR, that is regulation of

cognitive processing during their collaborative learning. However, affect and MR have mostly been studied separately in collaborative learning. Thus, the research question in the present in-depth case study was to unveil the kinds of observable affect manifested during verbalized MR in collaborative science learning, and to compare how it played out in good- and weak-outcome groups. The participants were senior high school students comprising two small groups of three girls. The groups were selected for a closer analysis from a larger sample of groups. The groups conducted a scientific experiment in virtual learning context according to the phases of scientific research. Data of this study were video recordings of the groups' interactions. Observable affect and MR were analyzed independently by two coders and inter-coding was established for each analysis. The findings based on micro-level analysis, cross-tabulations and visualizations show that the good-outcome group displayed more affect than the weak-outcome group during MR, especially positive low-intensity during socially shared metacognitive regulation. In conclusion, it seems that affect during MR such as positive-low intensity during socially shared metacognitive regulation might be advantageous in a good-quality collaborative learning outcome.

Understanding the process of self-determined learning motivation in vocational education

Presenting Author:Mathias Mejeh, University of Bern, Switzerland; **Co-Author:**Tina Hascher, University of Bern, Institute of Educational Science, Switzerland

The relevance of self-directed learning for successful teaching-learning processes has already been confirmed in various studies and self-determined motivation is seen as a necessary prerequisite both for the initiation and for the maintenance of learning processes. However, there is a paucity of research regarding the development of self-determined motivation in vocational education. Our study, thus, aims at investigating the development of the different forms of self-determined motivation (Ryan & Deci, 2000) among first-year vocational school students that take part in a self-directed learning intervention program compared to a control group with teacher-focused instruction. In a quasi-experimental design, 88 vocational school students are followed over 12 months. The students answer weekly via a specific app to a short questionnaire on self-directed motivation. The developmental process is analyzed under a temporal perspective using time series analyses, since, in contrast to pre-post measurements, time series analyses are able to measure the process in the course of a learning sequence and provide more detailed information about its effectiveness. Preliminary results from trend analysis based on seven measurement times show a slightly negative trend for the experimental group with regard to the identified regulation and no effects for other forms of self-determined motivation. For the control group, positive trends for the intrinsic, identified and introjected regulation can be identified. However, also a trend for an increase of amotivation can be found. The preliminary trends will be specified with upcoming measurement times.

Self-regulated learning after stressful events: The role of resilience and future time perspective

Presenting Author:Joost Jansen in de Wal, University of Amsterdam, Netherlands; **Co-Author:**Lucija Andre, University of Amsterdam, Netherlands; **Co-Author:**Jaap Schuitema, University of Amsterdam, Netherlands; **Co-Author:**Thijmen Van Alphen, University of Amsterdam, Netherlands; **Co-Author:**Thea Peetsma, University of Amsterdam, Netherlands

To successfully deal with the fast-paced changes in 21st century work and society, both students and teachers need to be able to self-regulate their learning. The regulation of emotions is an important process that precedes SRL-behaviours because many learning situations are potentially stressful. This study investigates the combined role of two factors that appear to be important in this process but have been insufficiently studied: everyday resilience and future time perspective (FTP). 40 teachers and 154 students filled in traditional questionnaires and completed three weeks of daily quantitative diaries about stress, resilience, FTP and SRL-behaviours. The results showed strong negative relationships between stress (anxiety) and buoyancy for both teachers and students, also on a daily level for teachers. For students, different types of anxiety, such as learning, class, and test anxiety related negatively to buoyancy, with the strongest association between test anxiety and buoyancy. Moreover, both teachers' and students' FTP showed strong positive association with their SRL-behaviours. FTP and buoyancy related positively in the student sample only. Whereas for students stress (anxiety) was negatively related to their investment in learning, teachers' daily stress (anxiety) positively correlated with time spent on – and investment in – professional learning. Overall, these results provide significant insight for the negative associations between stress (anxiety) with buoyancy and FTP for teachers and students. Also, results suggest that FTP plays a significant positive role in promoting SRL-behaviours. These results provide a baseline for designing intervention on FTP that can stimulate SRL-learning, and decrease stress of teachers and students.

The relationship between eudaimonic and hedonic motives and self-regulated learning

Presenting Author:Bernhard Schmitz, TU Darmstadt, Germany; **Co-Author:**Björn Matthes, Technical University of Darmstadt, Germany

The importance of motivation for self-regulated learning is well-known. Often investigated were extrinsic and intrinsic motives. New approaches are interested in hedonic and eudaimonic motives (Huta & Ryan, 2010). Work studies (cf. the happy-productive worker hypothesis, Cropanzano & Wright, 2001) propose that eudaimonic motives have beneficial effects. Our hypothesis is that hedonic and eudaimonic motives are related to self-regulated learning. It is important to study actual learning behavior, because this is more ecological valid than one single occasion trait measures (cf. Schmitz, 2006). In our study, we measure learning in real life situations. Data stem from 26 students (mean age = 20.3) from a Western university, mostly studying informatics, that worked on electronic diaries for 21 days. The diaries measure hedonic and eudaimonic motives, goal-setting, time investment, emotion and subjective evaluation of the learning. Internal consistency for the scales reaches from .77 to .96. As data stem from days nested within students, hierarchical linear models (HLM) were applied for each dependent variable. Results show for example for the dependent variable goal setting that the amount of interindividual variance was quite high (ICC=.57). The predictor eudaimonic motives were significant positive ($\beta = .01$, $t = 2.95$) and for hedonic motives significant negative ($\beta = -.02$, $t = -3.69$). Similar results were found for time investment and learning results. The results are discussed with respect to the importance of eudaimonic motives for daily learning.

Session M 13

25 August 2021 12:00 - 13:00

Session Room 8

Symposium

Learning and Social Interaction, Lifelong Learning

"Is this credible information?" Investigations on the Evaluation of Scientific Online Information

Keywords: Attitudes and Beliefs, Educational Psychology, Informal Learning, Qualitative Methods, Reasoning, Science Education, Technology

Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Friederike Hendriks, TU Braunschweig, Germany

Organiser: Friederike Hendriks, TU Braunschweig, Germany

Organiser: Maria Zimmermann, Germany

Organiser: Elisabeth Mayweg, Germany

Discussant: Iris Tabak, Ben-Gurion University of the Negev, Israel

Many of today's pressing issues are socio-scientific in nature: They are ill-structured problems that largely depend on scientific knowledge but also entail social and political questions and solutions. Two currently highly debated are issues are climate change and the Covid-19 pandemic, but these are also two of the most politically contested. Scientific knowledge on both issues partly rests on uncertain, sometimes even conflicting evidence; and beyond this, misinformation spreads easily in social media (Lewandowsky et al., 2020). Therefore, it is especially important to find out how laypeople deal with scientific information in online environments. This symposium brings together empirical studies investigating factors for laypeople's determinations on whether information is credible, whether sources are trustworthy, and instructional means to foster such determinations. Study 1 aims at finding out how belief-consistency and text difficulty of scientific information affect claim evaluation, while study 2 examines how laypeople evaluate source trustworthiness depending on the communication of scientific uncertainty, also taking prior beliefs into account. In study 3, credibility evaluations of YouTube videos vs. websites are studied, focusing on differences in epistemic criteria students use. Finally, study 4 determines whether credibility labels attached to social media posts influence reasoning about whether to "like" a post. All studies hold educational implications regarding students' online information evaluation skills, especially in the context of misinformation-prone topics like climate change and Covid-19. The discussion will further delve into educational implications and audience interaction will be alleviated using audience

response tools.

Information easiness and prior beliefs influence evaluation of scientific online information

Presenting Author:Lisa Scharrer, Ruhr-Universität Bochum, Germany; **Co-Author:**Rainer Bromme, University of Münster, Germany; **Co-Author:**Marc Stadtler, University of Bochum, Germany

Previous research has shown that the easiness by which textual information on a scientific issue can be understood seduces laypeople to overlook limitations in their evaluative capabilities despite usually lacking the deep-level knowledge required for fully informed validity judgments. This study investigates whether text easiness influences laypeople's evaluation of scientific claims even if they possess prior beliefs about the claims' accuracy. Laypeople who held strong prior beliefs about human behaviour as the major cause of climate change read argumentative texts that were either easy or difficult to understand and that supported a claim either consistent or inconsistent with their beliefs. The results show that prior beliefs moderate the influence of text easiness: Easiness affects laypeople's evaluation of scientific claims about which they hold prior beliefs – but only if these claims are in accordance with their beliefs. Apparently, both text difficulty and belief-inconsistency remind laypeople of their own evaluative limitations.

"Mask wearing might be effective!" Does uncertainty communication affect source evaluation?

Presenting Author:Inse Janssen, Westfälische Wilhelms-Universität Münster, Germany; **Co-Author:**Friederike Hendriks, TU Braunschweig, Germany; **Co-Author:**Regina Jucks, WWU Münster, Germany

Scientific knowledge is inherently uncertain and can only provide tentative orientation for political decisions. Past discussions on the introduction of mandatory mask-wearing in the public sphere to contain the coronavirus, are an illustrative example for this matter of fact. On the one hand, the assessment of uncertainty is remarkably relevant for informed-decision making (Fischhoff & Davis, 2014) and is hence also indispensable within science education. On the other hand, scientists are skeptical about communicating uncertainty publicly (Post, 2016). The present study investigates how the communication of uncertainty, regarding the effectiveness of mandatory mask-wearing to contain the coronavirus affects the perceived trustworthiness of scientists and politicians. All participants ($N = 396$) read a fictitious but evidence-based text arguing for mandatory mask-wearing. In the text, we firstly varied whether the information giver was a scientist or a politician. Secondly, we manipulated whether epistemic uncertainty was communicated by including lexical hedges to the text or not (e. g. "maybe"; Hyland, 1996). Subsequently participants rated their perceived trustworthiness (expertise, integrity, benevolence) of the information giver. Results show that the scientist was perceived as more competent ($p < .001$, $\omega^2 = .06$) and integer ($p = .005$, $\omega^2 = .01$) but not as more benevolent than the politician. The use of lexical hedges did not affect trustworthiness ratings. Implications for the communication of scientific evidence concerning political issues are made.

Students' Epistemic Criteria for Evaluating Climate Change YouTube Videos

Presenting Author:Fayez Abed, University of Haifa, Faculty of Education, Israel; **Co-Author:**Sarit Barzilai, University of Haifa, Israel

YouTube is widely used for learning about scientific issues in and out of school. However, a significant portion of the science information on YouTube is inaccurate. The purpose of this study was to examine how students evaluate scientific YouTube videos on climate change in comparison to webpage evaluation. Eighth grade students were asked to rank six YouTube videos and six webpages on the topic of climate change and to justify their rankings. Students' epistemic criteria were coded according to three main categories: communicative criteria (including visual, auditory, verbal, and experiential criteria), representational criteria (including explanation quality, comprehensiveness, veracity, and source expertise), and task affordance criteria (including task relevance and understanding affordances). The results indicated that students based their evaluations most frequently criteria of visual quality, verbal quality, experience of use, and explanation quality. Criteria of veracity and source expertise were infrequently mentioned. Thus, students were sensitive to video quality, but they usually did not critically evaluate video credibility. There were many similarities between students' epistemic criteria for evaluating YouTube videos and webpages. However, students tended to refer more frequently to experiential criteria when evaluating YouTube videos, suggesting that evaluation of YouTube videos may be more strongly grounded in personal experience and affect. Students' epistemic criteria for evaluating YouTube videos predicted their judgments of video quality. These results suggest that evaluation of YouTube videos poses some unique challenges that source evaluation instruction may need to attend to.

"Liking" social media posts with credibility labels: The role of epistemic aims and criteria

Presenting Author:Christiana Varda, Cyprus University of Technology, Cyprus; **Co-Author:**Eleni Kyza, Cyprus University of Technology, Cyprus

Social media blend opinion, entertainment and authoritative information; despite this complex information landscape, these are the spaces people rely on to stay informed. Information evaluation online is challenging, and while it can be guided by epistemic aims, such as curiosity or knowledge, evaluation decisions may be obscured by biases, intuition and non-epistemic criteria in the interest of time and convenience. Supporting information evaluation online is important, considering the threats of exposure to misinformation on social media. Credibility labels have shown promise in helping individuals make accurate judgements on information. In a recent experimental study ($n=177$) we found that individuals with more salient epistemic beliefs were less likely to "like" a misinformative post. This work extends prior findings through a follow-up qualitative study that sought to understand the reasoning processes behind "liking" a post: the aims and criteria used to decide on the action when evaluating information across three credibility labels (Not Credible, Uncertain Credibility, Credible), as compared to posts without a credibility label. The analysis of 15 adult users' actions, think-alouds, and retrospective interviews, suggests that credibility labels engage participants to take action based on epistemic aims, as compared to the baseline, and that the criteria used for deciding on the action were influenced by the type of credibility label and the information context. Findings suggest the potential of credibility labels to support adult social media users' engagement with epistemic aims and criteria on social media and hold implications for redesigning these spaces to support critical reflection.

Session M 14

25 August 2021 12:00 - 13:00

Session Room 1

Symposium

Different perspectives in understanding teacher and student adjustment and well-being

Keywords: At-risk Students, Attitudes and Beliefs, Educational Psychology, Emotion and Affect, Peer Interaction, Primary Education, Secondary Education, Self-efficacy, Social Aspects of Learning and Teaching, Social Interaction, Teacher Effectiveness, Teaching/Instruction

Interest group:

Chairperson: Eija Pakarinen, University of Jyväskylä, Finland

Organiser: Eija Pakarinen, University of Jyväskylä, Finland

Discussant: Lars-Erik Malmberg, University of Oxford, United Kingdom

Supportive relationships with peers and teachers are important in promoting students' school adjustment. Furthermore, lowered efficacy and student problem behaviors might compromise teacher well-being and adjustment. This symposium is organized to deepen our understanding on different factors that might play a role in educational adjustment and well-being of both students and teachers. For example, less is known how relationships with students also contributes to teacher well-being and how student perceptions of instructional quality are related to their peer relationships. The first paper examines the association between student perceptions of teachers' instructional support quality and students' peer relationships as aspects of students' social and emotional well-being in Norwegian lower secondary school classrooms. Furthermore, the aim was to investigate the impact of individual (e.g., mental health, aggression) and classroom factors (e.g., observed instructional support) on student perceptions of instructional support quality and peer relationships. The second paper investigates the cross-lagged associations between teacher perceptions of efficacy and inadequacy in a sample of Finnish first grade teachers. In addition, the role of students' support needs was accounted. The third paper investigates whether teachers benefit from P2G intervention by investigating effects on their perceived control and emotions towards externalizing preschoolers. In addition, the interplay between teacher adjustment and child behavioral engagement was investigated. The papers presented in the symposium contribute to the knowledge base on different factors related to educational adjustment and well-being of both teachers and students. Theoretical and practical implications will be discussed.

Teachers' instructional support and students' peer relationships quality

Presenting Author:Sigrun K. Ertesvåg, University of Stavanger, Norway; **Co-Author:**Trude Havik, University of Stavanger, Norway; **Co-Author:**Maren Stahl Lerang, University of Stavanger, Norway; **Co-Author:**Grete Sørensen Vaaland, University of Stavanger, Norway

The aim of the study was to investigate the association between student perceptions of teachers' instructional support quality and students' peer relationships as aspects of students' social and emotional well-being. A second aim was to investigate the impact of individual (e.g., mental health, aggression) and classroom factors (e.g., observed instructional support) on student perceptions. The sample contained students (1650) in 79 lower secondary classrooms. The students reported on a web-based questionnaire in the beginning (T1) and the end (T2) of one academic year. The questionnaire contained scales on perception of teachers' instructional support, peer relationships in the classroom, mental health, aggressiveness, and student demographics. In addition, classrooms were observed for four lessons throughout the year. The observations were scored on 5 dimensions of instructional support using Classroom Assessment Scoring System-Secondary (CLASS-S). Multilevel structural equation modelling was applied to investigate the variation between classrooms in perceived teacher instructional support and peer relationships in the classrooms, as well as the association between instructional support and peer relationships at the end of the school year. The results indicated that classrooms differed in terms of perceived instructional support and peer relationships. Moreover, high quality instructional support was associated with high quality peer relationships. Students' mental health problems were negatively associated with perceived instructional support and peer relationships, while students' aggressiveness was negatively associated with perceived instructional support. There was no significant association between aggressiveness and quality of peer relationships.

Teacher self-efficacy and perceived inadequacy across Grade 1

Presenting Author:Ville Rokala, University of Jyväskylä, Finland; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Sirpa Eskelä-Haapanen, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

Teaching is a highly stressful occupation. Although teacher stress has been widely investigated, we are still far from understanding the determinants of teacher occupational well-being, such as experiences of inadequacy and self-efficacy. The present study investigated cross-lagged associations between teachers' sense of inadequacy and self-efficacy during one academic year. Students' support needs and teacher experience were controlled for in the analyses. The participants of this study were 52 Finnish first grade teachers who participated in a larger study. The results of cross-lagged path models showed that teacher sense of inadequacy was negatively associated with subsequent teacher self-efficacy, especially dimensions of student engagement and classroom management. In addition, the higher number of students with support needs in terms of social and behavioral problems was related to lower teacher efficacy. Teachers' work experience was also associated with their perceptions of self-efficacy. The results of this study might help in finding ways to support teachers' self-efficacy and avoid burnout symptoms and turnover intentions.

The role of teacher-child interactions for teacher adjustment: An intervention study

Presenting Author:Karine Verschueren, KU Leuven, Belgium; **Co-Author:**Anne-Katrien Koenen, KU Leuven, Belgium; **Co-Author:**Sanne Van Craeyvelt, KU Leuven, Belgium; **Co-Author:**Caroline Vancraeyveldt, KU Leuven, Belgium; **Co-Author:**Hilde Colpin, KU Leuven, Belgium

Playing-2-gether (P2G) is an intervention for teachers in interaction with preschoolers showing signs of externalizing behavior. P2G provides teachers with tools to effectively interact with the children and manage their behavior. Previous research has shown positive effects on child behavior and the teacher-child relationship. The present study hypothesized that P2G affects teacher adjustment as well: P2G may strengthen teachers' perceived control and positive emotions, and reduce negative emotions towards the child. In addition, the interplay between teacher adjustment and child behavioral engagement was investigated. A randomized controlled trial study was conducted in 46 schools, among 175 externalizing preschool boys and their teachers. Teacher perceived control and child behavioral engagement were measured by teacher questionnaires and teacher emotions with a diary method. In the intervention condition, P2G was implemented during 12 weeks; the control condition received education as usual. Variables were assessed at three times (T1 = pre-test, T3 = post-test and T2 = in-between intervention components). Cross-lagged path analyses revealed a direct intervention effect on teacher perceived control and a marginally significant effect on positive and negative emotions at T3. In addition, a significant indirect effect on perceived control, and a marginally significant indirect effect on negative emotions at T3 through behavioral engagement at T2 were found. As such, this study indicates that P2G effects extend to teachers, by improving their perceived control and emotions towards externalizing preschoolers, and that these teacher outcomes are at least partially explained by increased child behavioral engagement.

Session M 15

25 August 2021 12:00 - 13:00

Session Room 18

Espresso Invited Symposium

Teaching and Teacher Education

E-CER: In search of the 'good' teacher: Perspectives on teacher competence

Keywords: Assessment Methods and Tools, Developmental Processes, Educational Psychology, Emotion and Affect, In-service Teacher Education, Meta-analysis, Motivation, Pre-service Teacher Education, Quantitative Methods, Self-efficacy, Teacher Effectiveness, Teacher Professional Development, Teaching/Instruction, Video Analysis

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Mareike Kunter, Germany

Organiser: Mareike Kunter, Germany

Organiser: Robert Klassen, University of York, United Kingdom

Discussant: Tina Seidel, Technische Universität München, Germany

What constitutes a "good" teacher? Naturally, good teachers should show high quality teaching and have a positive impact on their students. However, what are the individual characteristics that enable teachers for high quality teaching, and which of these characteristics can be addressed through adequate selection, qualification or professional development? The newly founded EARLI Centre for Excellence in Research Group (E-CER) "In Search of the Good Teacher" seeks to find theoretical and empirical answers to these questions. The group unites international researchers who have been working on theoretical models about "good teachers", and who have developed novel methods to assess teacher variables directly. In this symposium E-CER members present studies that investigate various teacher characteristics and link them to a range of educational outcomes. An integrative discussion of these findings will be a starting point for advancing our understanding of what it takes to be a competent teacher.

Teachers' Psychological Characteristics: An Integrative Review

Presenting Author:Lisa Bardach, University of Tübingen, Germany; **Co-Author:**Robert Klassen, University of York, United Kingdom; **Co-Author:**Nancy Perry, University of British Columbia, Canada

This integrative review aims to render a systematic account of the role that teachers' psychological characteristics, such as their motivation and personality, play for critical outcomes in terms of teacher effectiveness, teachers' well-being, retention, and positive interpersonal relations with multiple stakeholders (students, parents, principals, colleagues). We therefore summarize and evaluate the available evidence on relations between eight identified psychological characteristics—self-efficacy, causal attributions, expectations, personality, enthusiasm, emotional intelligence, emotional labor, and mindfulness—and these outcomes derived in existing research syntheses (meta-analyses, systematic reviews). The results highlight that self-efficacy, mindfulness, emotional labor, enthusiasm and emotional intelligence all appear to be relevant for teachers' well-being. Being taught by a teacher characterized by high levels of self-efficacy and enthusiasm and high academic expectations for students, who attributes academic success to students' efforts could help raising students' achievement and motivation. At the same time, our review's findings single out under-studied outcomes in research on teachers' psychological characteristics, namely teachers' retention and establishment of positive relations (e.g., with students) that deserve more attention in future research.

Teacher's early stress early stress predicts their later well-being: A 10 year longitudinal study

Presenting Author:Uta Klusmann, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Thamar Voss, University of Freiburg, Germany; **Co-Author:**Dirk Richter, University of Potsdam, Germany; **Co-Author:**Mareike Kunter, DIPF | Leibniz Institute for Research and Information in Education, Germany

The transition into the teaching profession is demanding and, for many beginning teachers, accompanied by stress experience and lower well-being. However, beginning teachers differ in the level of their early professional stress experience. In the present study, we accompanied over 250 beginning teachers from their first year of teaching to 10 years later. We used data from four measurement points and an additional diary study to investigate the development of beginning teachers' emotional exhaustion and job satisfaction. Moreover, we examined whether symptoms of early stress experience - such as intentions to quit, a high number of daily hassles, and a decrease in emotional exhaustion during the first year of teaching - can predict teachers' professional adjustment after a decade. The results of our longitudinal analysis revealed an increase in the mean level of emotional exhaustion and stability in beginning teachers' job satisfaction. Moreover, beginning teachers' early stress experiences was predictive for teachers' well-being ten years later.

Changes in perceived teaching competences for types of beginning teachers, sources and implications

Presenting Author:Helen Watt, The University of Sydney, Australia; **Co-Author:**Paul Richardson, Monash University, Australia

The work of teachers is complex and encompasses multiple competences. Teachers' self-efficacy for their teaching competence(s) has proven a powerful predictor for a range of important teacher, and student, outcomes. Continuing criticism of the narrowness of teacher efficacy operationalisations (Friedman & Kass, 2002; Tschanen-Moran et al., 1998, 2001) argues they fail to tap the complexity of the teacher's role. Friedman in particular (2000) argued that competences beyond the classroom should be included. We extended the most widely-used Teachers' Sense of Efficacy Scale (TSES), to build a comprehensive and ecologically-valid measure by developing new items to tap 5 additional competences: 'Critical reflection on practice', 'Value cultural diversity', 'Professional interactions with the community', 'Respect confidentiality' and 'Meet legislated ethical requirements'. Beginning teachers (N=339) from four Australian universities completed our Self-Efficacy for Teaching ('SET') scale at two timepoints: near the end of teacher education, and again during early career teaching (M=3 years). CFAs established psychometric validity, and scalar invariance across timepoints was supported. We used the SET to explore potentially different change patterns until teachers' early career, distinguishing demographic/school contextual characteristics, and impacts on level of professional engagement. Major implications relate to targeting the skills in which beginning teachers feel less efficacious, and may require increased support in teacher education preparation and early professional mentoring.

Standardized Mixed-Reality Simulation Tasks: A New Measurement Approach to Improving Teaching

Presenting Author:Courtney Bell, University of Wisconsin, United States; **Co-Author:**Geoffrey C. Phelps, Educational Testing Service, United States; **Co-Author:**Barbara Weren, Educational Testing Service, United States; **Co-Author:**Daniel McCaffrey, Educational Testing Service, United States; **Co-Author:**Margaret M. Witherspoon, Educational Testing Service, United States

Teaching is complex professional work; it is also one critical policy lever for improving the life outcomes of all children. There is a great deal for teacher to learn across the teaching career. As teachers move from grade to grade, or for primary school teachers, from mathematics to science, they are required to learn and adapt to regularly changing contexts. Under these circumstances it is not enough to know a subject and students. Teachers have to be able to interact with groups of students in real time to accomplish multiple goals within a given subject matter. Researchers, teacher educators and professional developers use varied measurement tools to assess and guide teacher learning. This paper describes and provides preliminary validity evidence on a new type of teacher performance assessment tool that measures three core teaching practices: modeling and explaining content, leading group discussion, and eliciting and interpreting student thinking. Drawing on standardized mixed-reality simulation performances from more than 400 primary grades preservice teachers in nine U.S. states, we provide initial evidence on three types of teaching tasks in English/language arts and mathematics in grades K-6. Analyses of descriptive statistics, task and rater reliability, teachers' perceptions of tasks, and concurrent validity evidence suggest there are both affordances and constraints of this new measurement approach. The implications of this approach are considered for researchers and others concerned with the improvement of teaching.

Session M 16

25 August 2021 12:00 - 13:00

Session Room 15

Invited Symposium

Higher Education

SIG 24: Developing research and academic careers in uncertain times

Keywords: Collaborative Learning, Doctoral Education, E-Learning/Online Learning, Emotion and Affect, Higher Education, Learning Technologies, Reflection, Researcher Education, Social Aspects of Learning and Teaching, Social Interaction

Interest group: SIG 24 - Researcher Education and Careers

Chairperson: Montserrat Castelló, Ramon Llull University, Spain

Organiser: Erika Löfström, University of Helsinki, Finland

Discussant: Kirsi Pyhältö, University of Helsinki, Finland

The SIG 24 Invited Symposium draws together collaborative research initiatives by participants in the SIG 24 Meeting. The SIG 24 Online meeting was organised in January 2021 under the theme *Research and academic careers in uncertain times*.The meeting hosted tracks along the three themes of impact of the pandemic on research activities, remote supervision, and online collaboration. More specifically the tracks address the following themes: 1) The impact of the COVID-19 pandemic on researcher activity and development, 2) Remote doctoral supervision experiences: challenges and affordances; and 3) (How) can the research on two-mode virtual communication help us refine our online collaboration? In the symposium, we share the results of the work within each of the tracks.

The impact of the COVID-19 pandemic on researcher activity and development

Presenting Author:Inge Van der weijden, Leiden University, Netherlands; **Co-Author:**Montserrat Castelló, Ramon Llull University, Spain; **Co-Author:**Agata Lambrechts, University of York, United Kingdom; **Co-Author:**Irina Lokhtina, University of Central Lancashire Cyprus, Cyprus; **Co-Author:**Erika Löfström, University of Helsinki, Finland; **Co-Author:**Michelle McGinn, Brock University, Canada; **Co-Author:**Isabelle Skakni, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland

In light of the Covid-19 crisis, researchers across disciplines may experience a disproportional impact of the pandemic on their research experience that may have a long-lasting effect on their academic development. It is crucial, therefore, to know what kind of research doctorate holders at different stages of their careers are doing, where this research is located, how the pandemic has influenced their research activity and lives as well as how researchers are coping with the challenge. We synthesised the results of a literature review of recent studies that examined the impact of the COVID-19 pandemic on researcher activity and development. Moreover, we engage the literature review in a dialogue with research on personal and professional aspects of academic life conducted by members of SIG 24. The results shed light on the unequal impact of the pandemic on researcher experience at different stages of career development and across disciplines.

Remote doctoral supervision experiences: challenges and affordances

Presenting Author:Erika Löfström, University of Helsinki, Finland; **Co-Author:**Søren Bengtsen, Aarhus University, Denmark; **Co-Author:**Solveig Cornér, University of Helsinki, Finland; **Co-Author:**Faye He, Peking University, China; **Co-Author:**Kelsey Inouye, Oxford University, United Kingdom; **Co-Author:**Shosh Leshem, Kibbutzim College of Education, Israel, Israel; **Co-Author:**Irina Lokhtina, University of Central Lancashire Cyprus, Cyprus; **Co-Author:**Michelle

McGinn, Brock University, Canada; **Co-Author:**Matilda Sase, Benue State University, Nigeria; **Co-Author:**Gina Wisker, University of Bath, United Kingdom

This contribution examines from the points of view of supervisor and of doctoral candidates how supervision manifests itself in times when many study-related interactions take place at a distance. In doing so, challenges and affordances, and effective practices are considered. The presentation draws on a literature review synthesising insights on intellectual/cognitive; instrumental; ontological; professional and personal/emotional aspects of supervision. Throughout the pandemic, remote supervision has merged, and sometimes confused the professional and the private (research and writing are now carried out from home), the home and the institution (the home becomes a proxy of the institution in a very tangible manner), and the physical and the digital (the digital being now predominant and no longer peripheral). It is not until now that academics on a broad scale have engaged in remote supervision, and the need to understand this activity is greater than ever before.

(How) can the research on two-mode virtual communication help us refine our online collaboration?

Presenting Author:Montserrat Castelló, Ramon Llull University, Spain; **Co-Author:**Citra Amelia, Deakin University, Indonesia; **Co-Author:**Josephine Bergmans, Leiden University, Netherlands; **Co-Author:**Laura Colombo, University of Buenos Aires, Argentina; **Co-Author:**Kelsey Inouye, University of Oxford, United Kingdom; **Co-Author:**Marian Jazvac-Martek, McGill University, Canada; **Co-Author:**Irina Lokhtina, University of Central Lancashire Cyprus, Cyprus; **Co-Author:**Erika Löfström, University of Helsinki, Finland; **Co-Author:**Lynn McAlpine, McGill University, Canada; **Co-Author:**Anna Sala-Bubaré, Ramon Llull University, Spain; **Co-Author:**Anu Tammeleht, Tallinn University, Estonia

Given the fact that technologies have become more accessible and widespread, online communication in academia in teaching/ learning and research has increased. Further, the global disruptions in 2020 have accelerated the pace of our virtual communication. As a result, we undertook a virtual collaborative study aiming at a better understanding of how to refine our online collaboration. We synthesised the results of a literature review of recent studies that examined the nature of *two-mode virtual collaboration and communication* and undertook a structured analysis of our own virtual collaboration processes while carrying out the study. The literature review is organised as follows: a) focus (teaching/research/supervision), b) type of relationships (pre-existing/forming), c) mode (synchronous/asynchronous), and (d) affordances/constraints of using virtual communication tools for academic purposes. The structured reflection examined social presence, power-distribution in the relations, and trust in terms of forming and sustaining relationships. The combination of different modes and the focus on our own communication process suggest both affordances in terms of communication being negotiable and evolving, and restraints in forming new relations given tools that may not be equally accessible to all. We hope our findings can help academics embrace the affordances and manage the constraints of online communication as well as to create a sustainable approach to the development of effective virtual learning spaces.

Session M 17

25 August 2021 12:00 - 13:00

Session Room 6

Workshop

Developmental Aspects of Instruction

Grasping Boundary Crossing Competence Development: How to Measure Learning Across Practices?

Keywords: Assessment Methods and Tools, Competencies, Interdisciplinary, Student Learning

Interest group: SIG 01 - Assessment and Evaluation

The ability to work together and co-create with others outside one's own scientific domain, institute, and/or culture, is regarded crucial for professionals to be able to respond to emerging global challenges. The boundary crossing theory as applied to the educational context provides helpful insights for designing education that generically supports students' learning across practices. One example of such an application is the comprehensive boundary crossing curricular learning trajectories as applied at Wageningen University (The Netherlands). These trajectories include learning goals and various learning activities that are supposed to gradually develop students' boundary crossing competence. A question mark is how to measure student competence development in cross boundary settings; a question relevant to both educational (assessment) and research advancement of learning across practices. The goal of this workshop is to share ideas for measurement of boundary crossing competence. This will amongst others be done by sharing experiences with the measurement of comparable constructs for learning across practices derived from e.g. inter- and transdisciplinary learning, intercultural learning, and/or education for sustainable development. By using various activating online tools, participants will exchange their own research and educational experiences, applying other's experiences to their own context, and co-create new ideas for measuring 'learning across practices'.

Grasping Boundary Crossing Competence Development: How to Measure Learning Across Practices?

Presenting Author:Carla Oonk, Wageningen University, Netherlands; **Co-Author:**Judith Gulikers, Wageningen University, Netherlands; **Co-Author:**Karen Fortuin, Wageningen University, Netherlands; **Co-Author:**Perry den Brok, Wageningen University, Netherlands; **Co-Author:**Cassandra Tho, Wageningen University, Netherlands; **Co-Author:**Nynke Post-Uiterweer, Wageningen University, Netherlands; **Co-Author:**Arnold Bregt, Wageningen University, Netherlands

The ability to work together and co-create with others outside one's own scientific domain, institute, and/or culture, is regarded crucial for professionals to be able to respond to emerging global challenges. The boundary crossing theory as applied to the educational context provides helpful insights for designing education that generically supports students' learning across practices. One example of such an application is the comprehensive boundary crossing curricular learning trajectories as applied at Wageningen University (The Netherlands). These trajectories include learning goals and various learning activities that are supposed to gradually develop students' boundary crossing competence. A question mark is how to measure student competence development in cross boundary settings; a question relevant to both educational (assessment) and research advancement of learning across practices. The goal of this workshop is to share ideas for measurement of boundary crossing competence. This will amongst others be done by sharing experiences with the measurement of comparable constructs for learning across practices derived from e.g. inter- and transdisciplinary learning, intercultural learning, and/or education for sustainable development. By using various activating online tools, participants will exchange their own research and educational experiences, applying other's experiences to their own context, and co-create new ideas for measuring 'learning across practices'.

Session N 1

25 August 2021 15:45 - 16:45

Session Room 2

Symposium

Teaching and Teacher Education

Student perceptions of teaching quality put to the test

Keywords: Assessment Methods and Tools, School Effectiveness, Teacher Effectiveness, Teaching/Instruction

Interest group: SIG 18 - Educational Effectiveness and Improvement

Chairperson: Hannah Bijlsma, University of Twente, Netherlands

Discussant: Anna-Katharina Praetorius, Institut für Erziehungswissenschaft, Switzerland

Teaching quality can be measured in several ways. Lesson observations are quite common and measuring student perceptions of teaching quality also becomes increasingly important. However, because the reliability and validity of student perceptions of teaching quality are often questioned, the use of student perceptions in educational practices is still limited. Although recent studies show that students can provide a reliable picture of their teacher, its validity is still subject to scientific debate. In this symposium, the results of three studies on the validity of student perceptions of teaching quality will be presented. The first study used students' perceptions to analyze the association between classroom composition characteristics and teaching quality. The aim of the second study was to identify the degree to which teachers, students and external observers agree on the extent to which teachers enact differentiated instruction. The third

study explored the concurrent validity of student perceptions of teaching quality, collected using a smartphone based measurement instrument. It was investigated to what extent student, inspectors and teacher perspectives about a lesson differ. After a short introduction, the three papers will be presented. Our discussant will reflect on the presentations, after which there will be time to discuss the findings.

Effects of student composition on teaching quality: Implications for the validity of student ratings

Presenting Author: Benjamin Caspar Fauth, University of Tübingen, Germany; **Co-Author:** Cansu Atlay, LEAD Graduate School & Research Network, Germany; **Co-Author:** Hanna Dumont, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:** Jasmin Decristan, University of Wuppertal; IDE-A-Research Center, Germany

This study focuses on the association between classroom composition characteristics and teaching quality, with a focus on the implications of such effects for the validity of student ratings. We examine how student ratings of teaching quality are associated with the student body that is taught. Multilevel analyses of a sample of 1,070 3rd graders have indicated that cognitive and motivational composition of the classroom had an association with the classroom management dimension of teaching quality, whereas socio-cultural composition was not associated to any of the teaching quality dimensions rated by the students.

Correlations at the classroom level have also pointed at a relationship between the teachers' and observers' ratings of classroom management and the composition of general cognitive abilities and interest. We suggest that these findings also have implications for the theoretical conceptualization and the empirical assessment of teaching quality.

Exploring Student Perceptions of Differentiated Instruction

Presenting Author: Marieke van Geel, University of Twente, Netherlands; **Co-Author:** Trynke Keuning, University of Twente, Netherlands

Assessing differentiated instruction requires information from multiple sources in order to gain insight into the relation between the chronological phases (from lesson period preparation to lesson preparation and enacting the lesson to lesson evaluation) and the match between the teachers' choices and their students' needs. In the current study, for 16 teachers insights from a classroom observation and interview with the teacher were combined with their students' perceptions (324 cases in total) of the degree to which their teachers enact the five principles for differentiated instruction (goal orientation, continuously monitoring, challenging all students, adapting instruction and exercises, stimulating self-regulation) in this lesson. Preliminary analyses reveal both perspectives provide insight into the enactment of the various principles. Data collection is expanded until December 2020, in order to be able to conduct IRT analyses, combined with a generalizability model. Results of these analyses will be presented at EARLI online conference in 2021.

A comparison of the teaching quality perspectives of school inspectors, students, and teachers

Presenting Author: Adrie Visscher, Univ. of Twente, Netherlands; **Co-Author:** Hannah Bijlsma, University of Twente, Netherlands

Little is known about how student perceptions of the teaching quality in a lesson relate to the teaching quality perceptions of teachers and school inspectors of the same lesson. In a collaborative project with the Dutch School Inspectorate, the three perspectives, measured by means of the digital Impact! tool, were studied to obtain a rich picture of teaching quality in Dutch secondary schools. Including the student perspective in the assessments provided an opportunity to clarify how students from different achievement levels perceive the quality of their lessons. The concurrent validity of the three perspectives was calculated by comparing the scores from inspectors, students and teachers. The results showed that the perceptions of students, inspectors and teachers differ significantly from each other. The same applies to low-, average and high-performing student's ratings of teaching quality.

Session N 2

25 August 2021 15:45 - 16:45

Session Room 1

Symposium

Motivational, Social and Affective Processes

Situational interest: change, development, and outcomes across different contexts

Keywords: Achievement, Educational Psychology, Emotion and Affect, Higher Education, Informal Learning, Lifelong Learning, Motivation, Motivation and Emotion, Physical Sciences, Quantitative Methods, Self-efficacy

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Katarina Nuutila, University of Helsinki, Finland

Organiser: Luke K. Fryer, The University of Hong Kong, Hong Kong

Discussant: K. Ann Renninger, Swarthmore College, United States

This symposium focuses on how situational interest changes during tasks, across courses and in naturalistic settings. The papers examine the impact of individual differences in motivation and competence, and task characteristics on interest experiences. The way situational interest is associated with other psychological processes (e.g., emotions), and outcomes (e.g., performance) is also addressed. In addition to shedding light on task-specific dynamics, this symposium also examines the early phases of interest and the developmental links between task-, course, and domain-specific interest. Papers 1 examined the mean-level changes in interest and self-efficacy, results showing both to decrease, only the latter predicting performance. In Paper 2, the predictive relationship between task values, expectancies, and emotions were studied at an intra-individual level, results indicating that higher interest predicts positive emotions, and lower interest, in turn, predicts negative emotions. Paper 3 and 4 drew on the assumptions of the four-phase model of interest development. Paper 3 employed a cross-lagged approach, focusing on the developmental links between task-, course- and domain-specific interest, the findings showing that these are related, yet the links are different across different task types. Paper 4 investigated the evolution of interest in a naturalistic setting (i.e., library), the method providing a promising way to capture interest development. Overall, these papers capture many of the complexities of situational interest, and demonstrate how changes in interest are connected to other psychological processes and task characteristics. Moreover, the findings from the papers provide important evidence toward refining our understanding of interest development.

Mutual relationships between the levels of and changes in interest and self-efficacy during a task

Presenting Author: Markku Niemivirta, University of Eastern Finland, Finland; **Co-Author:** Katarina Nuutila, University of Helsinki, Finland; **Co-Author:** Anna Tapola, University of Helsinki, Finland; **Co-Author:** Heta Tuominen, University of Turku, Finland; **Co-Author:** Gyongyver Molnar, University of Szeged, Hungary

Research suggests students' task engagement to be influenced by their situational interest and self-efficacy. However, relatively few studies have examined the extent to which these two motivational forces are connected during task processing, how they mutually change over the course of a task, and how those changes contribute to task performance. This was the aim of the present study. Hungarian university students ($N = 2211$) performed a computerized complex problem solving task in the MicroDyn-environment. Students rated their situational interest and self-efficacy in the beginning (T1), during (T2 and T3), and in the end of the task (T4). Latent growth curve models were used for analysing both linear and non-linear trajectories over time. The results showed both situational interest and self-efficacy to decrease in the beginning, but gradually level out during the task. Interest and self-efficacy in the beginning of the task were associated positively, as were their trajectories over time. Initial self-efficacy and less steep change in interest predicted task performance positively. Males outperformed females, and reported higher interest and self-efficacy in the beginning of the task. They also displayed less steep initial decrease in their interest. The fact that task performance was supported by higher initial confidence and less steep decrease in interest suggests that self-efficacy might play a more important role in the beginning of the task, while positive (or less negative) changes in interest might be more relevant during the task.

On-task expectancy, value, and achievement emotions: A combination of two Expectancy-Value-Models

Presenting Author: Belinda Berweger, Friedrich-Schiller-University Jena, Germany; **Co-Author:** Sebastian Born, University Hospital Jena, Center for Sepsis Control and Care, Germany; **Co-Author:** Julia Dietrich, Friedrich-Schiller-University Jena, Germany

Expectancy-value theories posit that perceived controllability of learning activities and task values are crucial forces in a learning process. According to Pekrun's control-value theory, control and value appraisals are important precursors of achievement emotions. The present study includes "on-task" interest value

combined with utility value, attainment value and perceived costs as posited by the expectancy-value theory of Eccles and colleagues. The aim of the study was to investigate the situational, state-level relationships of expectancy and value appraisals with different achievement emotions (joy, hope, boredom, anger). We assessed on-task appraisals and emotions with an event-based design in 95 undergraduate students taking part in a blended learning lecture. The research question was answered by conducting regression analyses at the situation level taking into account the nesting of the data. The results showed positive relationships of expectancy with positive emotions, but also with anger. High interest and attainment values during the learning tasks were linked to more positive emotions, while low interest and attainment values as well as high perceived costs were associated with negative emotions. Furthermore, our findings showed significant interactions of success expectancies and task values on emotions.

The course interest that tasks built

Presenting Author:Luke K. Fryer, The University of Hong Kong, Hong Kong; **Co-Author:**Alex Shum, The University of Hong Kong, Hong Kong; **Co-Author:**Evan Pickett, The University of Hong Kong, Hong Kong; **Co-Author:**George Akom, The University of Hong Kong, Hong Kong; **Co-Author:**Timothy Wotherspoon, The University of Hong Kong, Hong Kong

The paired development of an individual's knowledge and interest in an object/topic has well-established theoretical and empirical support. Their shared role within the learning experience has similar support but has less often in natural contexts such as the classroom. To address this gap, four studies in four foundation university courses were conducted across a semester of study. The research was conducted at one research intensive university in Hong Kong, with a mixture of first and second year students. This research was embedded into course lectures/tutorials by utilising a mobile platform to conduct short formative tests and surveys (QR codes presented with course materials). Difference testing compared pre-post domain interest and levels of interest in different tasks. Structural equation modelling tested the predictive relationships between prior domain interest and knowledge with students' interest in a range of lecture and tutorial tasks, and later interest in the course and/or domain. The pattern of results from the four studies suggest separate and sometimes contrasting roles for prior interest and knowledge with task interest. Findings confirmed the critical role of social learning experiences for building interest in courses of study. These studies support the evidenced based strategic choice of variety of course tasks to ensure students individual differences are addressed and long-term interest supported. The theoretical and practical implications, as well as future directions for research in this area are discussed.

Repeat Visitors: A Situation Designed to Examine the Earliest Phases of Interest Development

Presenting Author:Amanda Durik, Northern Illinois University, United States; **Co-Author:**Sarah Post, Cornerstones of Science, United States; **Co-Author:**Audra P. Jensen, Northern Illinois University, United States; **Co-Author:**Joy Pawirosetiko, Northern Illinois University, United States; **Co-Author:**Cody Gibson, Northern Illinois University, United States; **Co-Author:**Paul B. Dusenberry, Space Science Institute, United States

Interest develops initially because it is supported by the situation and then becomes internalized as individuals learn about the topic and recognize its value. It is difficult to study the earliest phases of interest development (i.e., what gets people to a task and keeps them there) in many research contexts (e.g., classrooms) because the task is usually compulsory. The current project established a free-choice situation in a public library to expose patrons to science content and to examine whether it fostered early phases of interest development. The main situational element was a large display placed in a high-traffic area that was designed to support situational interest in science. It was updated every two weeks to give patrons new material to learn and a reason to return. After five months patrons in general ($N = 141$) were surveyed to assess whether they noticed, engaged with, and returned to the display. The results suggested that the display triggered patrons' situational interest such that patrons who went to the library more often were more likely to notice the display. Patrons who liked features of the display that encouraged deeper interaction with the content were more likely to return regularly (maintained situational interest), and to continue their exploration of the science topic beyond what was present on the display itself (emerging individual interest). This approach encouraged a broad audience to engage in science-related content and could be used in other public spaces that have repeat visitors.

Session N 3

25 August 2021 15:45 - 16:45

Session Room 11

Symposium

Learning and Special Education

Comorbidity of learning disorders

Keywords: At-risk Students, Computer-assisted Learning, Learning and Developmental Difficulties, Learning Disabilities, Literacy, Mathematics, Meta-analysis

Interest group: SIG 15 - Special Educational Needs

Chairperson: Christin Schwenk, TU Dortmund University, Germany

Discussant: Bert De Smedt, KU LEUVEN, Belgium

Observations from educational practice and epidemiological studies show that children with one learning disorder (LD) often present with symptoms of another learning or neurodevelopmental (e.g., attention-deficit) disorder. Not enough is known about the etiology of this comorbidity beyond chance, which would be relevant to better respond to comorbidity in education. Three studies of this symposium address this research gap, assessing comorbidity profiles in LD: The longitudinal study of *Rodríguez et al.* tested the predictive power of kindergartners' domain-general and domain-specific skills for LD status in second grade. Multinomial logistic regressions performed especially well at identifying prospective specific and comorbid math LD. A lack of shared domain-general risk factors supports the Multiple Deficit Theory. The meta-analysis of *Viesel-Nordmeyer et al.* tested different etiological hypotheses on comorbidity of mathematical and reading difficulties. Children with comorbid LD showed additive cognitive profiles compared to groups with isolated LD, not only in reading and mathematics but also in executive functions. Executive functions also play a role in *Mammarella et al.* cross-sectional study on comorbidity overlaps between specific LD and ADHD. Mixed effects models revealed that while inhibition and switching are impaired in all clinical groups, weaknesses in visuospatial updating seem to be a marker for the ADHD component. Overall, intervention studies, especially those with active control groups, are scarce when it comes to comorbidity. This is where the fourth preregistered study of *Schwenk et al.* ties in, evaluating specific tablet-based basic reading and math interventions in children with comorbid LD.

Predicting learning disabilities status: The role of early domain-general and domain-specific skills

Presenting Author:Cristina Rodríguez, Universidad de La Laguna (1) Universidad Católica de la Santísima Concepción (2), Chile; **Co-Author:**Roberto Ferreira, Pontificia Universidad Católica de Chile, Chile

Numerous studies suggest that domain-general and domain-specific skills underlie reading and mathematics performance. A constellation of these factors seems to contribute to differentially predict reading disabilities (RD), mathematics disabilities (MD) and comorbidity between these two disorders (MRD). The present study examined kindergarten domain-general and domain-specific skills as predictors of children's profile membership in second grade. A sample of 184 children (RD, $N=22$; MD, $N=28$; MRD, $N=21$, and typically developing children [TA], $N=123$) were followed from kindergarten to second grade. They were assessed on a battery of domain-general (verbal and visuo-spatial working memory, RAN and IQ) and domain-specific skills (phonological awareness, letter sound, and symbolic and non-symbolic magnitude comparison) in kindergarten. In grade 2, they completed standardized tests to be allocated in each of the 4 groups. Multinomial logistic regression analyses indicated that the significant predictors of the best model among those tested were letter sound, symbolic and non-symbolic magnitude comparison, and RAN, as well as IQ. Furthermore, the model was highly successful at classifying MRD and MD children into groups with disabilities (81% and 64%, respectively) and moderately successful at classifying children specifically into MRD and MD (67% and 50%, respectively). The model was less sensitive for classifying the RD children into groups with disabilities (40%) and even less sensitive at classifying them as RD (9%). The current findings have important implications for early identification and intervention of learning disabilities.

Insight into the relationship between specific and comorbid learning difficulties – a meta-analysis

Presenting Author:Nurit Viesel-Nordmeyer, Technische Universität Dortmund, Germany; **Co-Author:**Julia Reuber, Zentrum für systemische Schulberatung (school psychology) Hamm, Germany; **Co-Author:**Jörg-Tobias Kuhn, TU Dortmund University, Germany; **Co-Author:**Kristina Moll, University Hospital, Ludwig-

Maximilians-University Munich, Germany; **Co-Author:**Heinz Holling, University of Muenster, Germany; **Co-Author:**Christian Dobel, University Hospital Jena, Germany

The causes underlying co-occurring learning difficulties in reading and mathematics are not yet well understood. In particular, it seems unclear to what extent the occurrences of isolated (reading or mathematics) and comorbid learning difficulties are related or represent populations with independent profiles. Supported by current research findings, three different explanatory models for the relation between isolated and comorbid learning difficulties are discussed: Firstly, comorbidity could be caused by shared risk factors underlying isolated and combined learning difficulties (under-additivity). Secondly, separate deficits of isolated learning difficulties, summing up to an additive profile for the comorbid group, can be assumed (additivity). Thirdly, comorbid learning difficulties could represent a distinct learning disorder, characterizing by a separate cognitive profile with more severe deficits and additional risk factors compared to the specific learning difficulties group (over-additivity).

The explanatory values of the three different aforementioned models was tested with a random-effects meta-analysis integrating results of 80 studies. Effect sizes in the domains of reading, mathematics and executive functions of (sub-)samples aged six to 12 were considered. A potential explanatory value of moderators (e.g., age, task, IQ) for a heterogeneous variance of the effect sizes was controlled.

The different meta-analytical calculations revealed that children with comorbid learning difficulties showed close to the sum of cognitive impairments observed for the isolated learning difficulties groups (additivity). This finding was consistent across numerous outcomes in reading, mathematical and executive function skills. The results will be discussed regarding their importance for more targeted interventions for children with comorbid learning difficulties.

Comorbidity overlaps between ADHD and Specific Learning Disorders

Presenting Author:Irene C. Mammarella, University of Padova, Italy; **Co-Author:**Giulia Crisci, University of Padova, Italy; **Co-Author:**Ramona Cardillo, University of Padova, Italy; **Co-Author:**Sara Caviola, University of Padova, Italy

The present study examines the comorbidity between specific learning disorders (SLD) and attention deficit and hyperactivity disorder (ADHD) by comparing the neuropsychological profiles of children with and without this comorbidity. Ninety-seven schoolchildren from 8 to 14 years old were tested: a clinical sample of 49 children with ADHD ($n=18$), SLD ($n=18$) or SLD in comorbidity with ADHD ($n=13$), and 48 typically-developing (TD) children matched for age and intelligence. Participants were administered tasks and questionnaires to confirm their initial diagnosis, and a battery of executive function tasks testing inhibition, switching, and verbal and visuospatial updating.

Using a mixed-effects modeling approach, our results showed that children in the clinical sample (ADHD, SLD, ADHD+SLD) exhibited impairments on executive function measures (inhibition and switching tasks) when compared with TD children. A more specific pattern only emerged for the updating tasks, in which children with ADHD, and those with SLD in comorbidity with ADHD had the worst performance. The clinical and educational implications of these findings are discussed.

Effects of tablet-based math and reading interventions in children with comorbid learning disorders

Presenting Author:Christin Schwenk, TU Dortmund University, Germany; **Co-Author:**Heike Mehlhase, University Hospital, Ludwig-Maximilians-University Munich, Germany; **Co-Author:**Ann-Katrin Schulz, TU Dortmund University, Germany; **Co-Author:**Teresa Mann, TU Dortmund University, Germany; **Co-Author:**Jörg-Tobias Kuhn, TU Dortmund University, Germany; **Co-Author:**Kristina Moll, University Hospital, Ludwig-Maximilian-University Munich, Germany; **Co-Author:**Gerd Schulte-Körne, University Hospital, Ludwig-Maximilian-University Munich, Germany

Comorbid learning disorders (reading and math, RMD) occur frequently (Moll et al., 2014), but research on effective interventions is still very scarce (i.e., see Powell et al., 2020). Therefore, we conducted a pre-registered multicentric study to investigate how children (third grade) with RMD benefit from app-based trainings.

The RMD children were randomly assigned to either an app-based basic mathematical training (BM), basic reading training (BR) or unspecific control (UC) training. Their training effects were compared to children with a specific reading (RD) or mathematical disorder (MD) receiving the specific training matching their impairments. First, within the RMD group, we expected a main training effect in favor of the specific apps (BR, BM) compared to the UC training. Second, we expected weaker training gains for the more severely affected RMD compared to the groups with only a specific deficit in reading or math.

Pretest scores significantly predicted posttest results on almost all math and literacy outcomes. Although both trainings proved effective (in the RMD and RD or MD groups together), the pattern was less pronounced in the RMD group. However, when directly comparing the training response in the RMD to the specific RD or MD groups, there was no clear evidence for a weaker response to training of the comorbid group. Taken together, the most important preliminary finding was that children with a comorbid math and reading disorder do not seem to respond differently to specific basic math or reading apps than those with a learning disorder in just one domain.

Session N 4

25 August 2021 15:45 - 16:45

Session Room 16

Symposium

Developmental Aspects of Instruction

Insights into the Precursors of Relational Reasoning

Keywords: Early Childhood Education, Mathematics, Primary Education, Problem Solving, Reasoning

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Elien Vanluydt, KU Leuven - University of Leuven, Belgium

Organiser: Elien Vanluydt, KU Leuven - University of Leuven, Belgium

Discussant: Matthew Inglis, Loughborough University, United Kingdom

Relational reasoning, and more specifically reasoning about multiplicative relations between quantities, is crucial for several topics across mathematics education (e.g., fractions, algebra, statistics) and beyond (e.g., economics, technology, physics). While the literature abundantly has documented learners' difficulties, recently more and more research yields striking evidence of young children's abilities to reason about quantitative relations in simple problems. The early elementary curriculum, however, barely pays attention to relational reasoning. The present symposium focuses on the state of the art of research on: (a) various relational reasoning abilities, (b) the ways these abilities are connected, and (c) their precursors in young children. A range of abilities will be addressed: multiplicative reasoning, proportional reasoning, and probabilistic reasoning. Moreover, also the spontaneous tendency in children to focus on such quantitative relations will be considered as a predictor. The studies in this symposium provide a state of the art in the domain, by showing which relational reasoning abilities are present before or at the very start of formal education. The studies moreover used a range of methodologies, including longitudinal designs and intervention studies. The first paper illustrates how multiplicative reasoning can be fostered at the end of kindergarten. The second one shows that children's patterning ability is associated with their early proportional reasoning abilities. The third paper investigates patterning and proportional reasoning as predictors of early probabilistic reasoning. The fourth and final paper analyzes how improving children's spontaneous focusing tendency fosters multiplicative reasoning and fraction knowledge.

Fostering multiplicative reasoning in early math education: A case study

Presenting Author:Xenia Vamvakoussi, University of Ioannina, Greece; **Co-Author:**Georgia Pitta, University of Ioannina, Greece; **Co-Author:**Maria

Kaldrimidou, x, Greece

Research indicates that young children are able to perceive multiplicative relations and tackle simple multiplicative situations pertaining to discrete as well as to continuous quantity. Early math education, however, typically provides very limited support for the development of early multiplicative reasoning. For example, the latest Greek Kindergarten math curriculum includes learning objectives pertaining to three fundamental multiplicative operations, namely iteration of a quantity, equi-partitioning, and measuring with different units, albeit only for discrete quantity. In addition, it does not provide any linguistic tools for the expression of multiplicative relations. We designed a program of activities addressing discrete and continuous quantities in a unified manner; providing learning experiences pertaining to the aforementioned multiplicative operations; and introducing terms for multiples and submultiples. We report results from a case study intervention investigating whether this program a) was within the range of abilities of pre-primary children, b) would enhance children's multiplicative reasoning competences. A group of four children who had just graduated from kindergarten participated in a 4-day intervention. They were pre- and post-tested individually with respect to their competences in recognizing multiplicative relations, solving simple multiplicative problems, recognizing the terms for multiples and submultiples, and explaining their answers. We found that the program of activities was well within the children's range of abilities. By the end of the intervention, the children implemented the intended strategies; invented their own strategies; discerned and verbalized multiplicative relations and anticipated the outcome of multiplicative transformations. These competences were fairly stabilized for 1:2:2:1, but less so for 1:3:3:1.

Early quantitative reasoning: The association between patterning and proportional reasoning

Presenting Author:Elien Vanluydt, KU Leuven - University of Leuven, Belgium; **Co-Author:**Nore Wijns, KU Leuven, Belgium; **Co-Author:**Joke Torbevens, KU Leuven, Belgium; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium; **Co-Author:**Wim Van Dooren, KU LEUVEN, Belgium

More and more research indicates the importance of quantitative reasoning in early childhood. One part of quantitative reasoning is proportional reasoning: It plays a critical role in people's mathematical development and is particularly hard to apprehend for children. More insight into the early development and potential precursors of proportional reasoning is required. Several researchers suggested patterning as a possible precursor. However, there is little empirical evidence, particularly at a young age. To address this gap, the current study explored if patterning in four to five-year olds (n=346) is associated with proportional reasoning one and a half year later. Regression analysis showed that patterning is a unique predictor of proportional reasoning ability over and above general background characteristics and general cognitive and numerical abilities. Although more evidence based on intervention studies is needed, this study is a first indication that it might be fruitful to implement patterning activities in early interventions which may stimulate the development of proportional reasoning later on.

We can count on curricular math for probability, but what else might be helpful?

Presenting Author:Anne-Sophie Supply, KU LEUVEN, Belgium; **Co-Author:**Nore Wijns, KU Leuven, Belgium; **Co-Author:**Wim Van Dooren, KU LEUVEN, Belgium; **Co-Author:**Patrick Onghena, KU LEUVEN, Belgium

Probability is rarely included in the early grade mathematics curriculum. This is remarkable, given that research suggests that young children are already capable of handling (instruction in) probability to a certain extent. Before considering inclusion of probability in the early grade mathematics curriculum, it might be beneficial to investigate how individual differences in probabilistic reasoning relate to curricular math performance as well as other mathematical abilities that are not yet included in the curriculum at that age but have crossroads with the domain of probability. The present study explored in six to seven-year olds (n=271) whether the ability to compare probabilities is associated with performance on a curriculum-based mathematics test, a proportional reasoning task, and a patterning task. Regression analysis showed that curricular math significantly predicted the ability to compare probabilities. Moreover, proportional reasoning significantly contributed to the prediction of the ability to compare probabilities above curricular math performance, but patterning ability did not. These results suggests that the inclusion of proportional reasoning activities on top of regular mathematical activities might support the development of children's probabilistic reasoning. However, intervention studies are needed to further investigate this avenue.

Guiding students' attention towards multiplicative relations around them: A classroom intervention

Presenting Author:Saku Määttä, University of Turku, Finland; **Co-Author:**Minna M. Hannula-Sormunen, University of Turku, Finland; **Co-Author:**Hilma Halmé, University of Turku, Finland; **Co-Author:**Jake McMullen, University of Turku, Finland

Learning fractions poses a challenge for many students in elementary school. Conceptual knowledge regarding fractions is an integral part for much of the mathematical knowledge that is to follow. Difficulties regarding conceptual understanding of fractions may be caused by the natural number bias, which leads students to use rules relevant to natural numbers also while dealing with fractions and more broadly rational numbers. The large number of studies around natural number bias and its occurrence indicate a need to develop novel ways to teach and learn about fractions in school. One source of these individual differences appears to be individual's tendency of spontaneous focusing on quantitative relations (SFOR), which is related to the development of rational number knowledge. We therefore conducted a quasi-experimental intervention program which aimed to improve students multiplicative relational reasoning and fraction knowledge. In the experimental condition students completed activities aimed at promoting their reasoning about multiplicative relations in everyday life. Overall, these activities had a positive effect on students' mathematical knowledge. Students in the experimental group made larger gains in their ability to describe multiplicative relations embedded in everyday situations than students in the control condition. As well, both groups had similar gains in their learning of fraction knowledge, despite the experimental condition replacing five traditional fraction lessons.

Session N 5

25 August 2021 15:45 - 16:45

Session Room 10

Symposium

Higher Education

Improving Study Success in Higher Education by Self-Assessments for Informed Study Decisions

Keywords: Achievement, Assessment Methods and Tools, Design-based Research, Higher Education, Quantitative Methods

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Laurie Delnoij, Open University, Netherlands

Organiser: Laurie Delnoij, Open University, Netherlands

Organiser: Pascale Stephanie Petri, Justus-Liebig-Universität Giessen, Germany

Organiser: Sofie Van Cauwenbergh, Ghent University, Belgium

Discussant: Edith Braun, Justus-Liebig-Universitaet Giessen, Germany

Providing adequate and personalized information prior to student enrolment helps prospective students in making informed study decisions and, thereby, improves student motivation, confidence, and success. A self-assessment (SA) can provide such information. In this symposium, validation data of three such SAs – contributing to the research field of study success in higher (online) education – will be presented and discussed. Study decision is conceptualized as an intrapersonal process, in which the three SAs aim at supporting different stages. Within this symposium, we will walk through the imaginary timeline of study decisions. First, Presenter1 will present a large scale tool measuring (non-)cognitive abilities and providing feedback on the fundamental question of students' academic readiness. Presenter2 goes beyond by discussing how five sources of validity evidence resulted in a SA that provides generic advice for further preparation for studying in higher *online* education. Finally, Presenter3 discusses a confirmatory SA approach, providing feedback that tackles the question of fit to a specific field of study. As this symposium consists of three (instead of four) presentations, due attention is paid to interaction and discussion. The SAs will be shortly demonstrated, gathering reactions from the audience through multimedia. Summing it up, together with prof. dr. Braun we will reflect on the specific foci presented and respective pros and cons, taking into account the audience's reactions. As the SAs are implemented in different countries, we will reflect on the framework conditions for longitudinal validation, leading to formalized study decision support in the context of higher (online) education.

Prediction of Study Success Based on Cognitive and Non-cognitive Skills towards Higher Education

Presenting Author:Sofie Van Cauwenbergh, Ghent University, Belgium; **Co-Author:**Elisabeth Roels, Ghent University, Belgium

Choosing a suitable study program is a challenging process for prospective students. First, students have to find a program of their interest and make an attainable choice. Secondly, they need to achieve study success if they want to stay on track to acquire a degree. However, a majority of students don't manage to pass all courses in their first year of tertiary education. The Columbus tool is an attempt to improve study orientation from secondary education towards higher education in Flanders. It is a large scale assessment and feedback instrument with the aim of improving the study decision process of prospective students. In an early stage, the instrument provides feedback on students' academic readiness. It measures cognitive and non-cognitive abilities through self-reports and assessments and gives prospective students feedback focusing on self-beliefs, motivation, regulative and cognitive strategies, numeric skills, reasoning, vocabulary, language strategies skills and study interests. The tool widely launched in 2016, since then items of some components were deleted or adjusted based on different reliability and validity tests. Last year, more than 25.000 students filled in one, more or all components of Columbus. The orientation tool needed an upgrade in terms of predictive integrative feedback. The differential predictive validity is examined across different tertiary education programs. This will enable students to evaluate their capacities with reference to specific study programs. The prototypical prediction model of Columbus and future steps in integrative feedback are to be presented at the EARLI conference.

Designing an Online Self-Assessment for Informed Study Decisions in Higher Online Education

Presenting Author:Laurie Delnoij, Open University, Netherlands; **Co-Author:**José Janssen, Open University of the Netherlands, Netherlands; **Co-Author:**Kim Dirkx, Open University, Netherlands; **Co-Author:**Rob Martens, Open University of the Netherlands, Netherlands

An online self-assessment for informed study decisions in higher online education is being developed following a design-based research approach. The rationale behind the self-assessment is that better decision making will address the ongoing concern of non-completion in higher online education. In the process of designing the self-assessment, five sources of validity evidence are collected: evidence on content, predictive value, internal structure, response processes, and consequences. Evidence on the content, internal structure and predictive value of the subtests was collected by means of a literature study and correlational research. Subsequently, in a user study, prospective students' opinions were investigated regarding the content of the self-assessment and the feedback provided aligned to the subtest. Based on the validity evidence collected so far, the prototypical self-assessment consists of four constituent tests – numerical skills, discipline, social support, and study intentions – and related feedback. The feedback consists of information on the obtained score, including a visualization, information on what was measured and why, and an advice for further preparation. At the conference, an interactive demonstration of the current prototypical self-assessment is provided and futures steps in collecting validity evidence, on users' response processes and the consequential validity of the self-assessment are to be discussed.

Does It Suit You? A Self-assessment Approach to Support Prospective Students' Study Choice

Presenting Author:Pascale Stephanie Petri, Justus-Liebig-Universität Giessen, Germany; **Co-Author:**Vera Weingardt, Justus-Liebig-Universität Giessen, Germany; **Co-Author:**Martin Kersting, Justus-Liebig-Universität Giessen, Germany

On the one hand, societies become increasingly knowledge-based resulting in a growing demand for highly educated workers (Di Stasio & Solga, 2017; Salmi et al., 2002). On the other hand, higher education dropout rates are relatively high (OECD, 2018, 2019; Vossensteyn et al., 2015). This discrepancy calls for action. The misfit between student's abilities and interest and the requirements in the field of study is often mentioned as a dropout reason (Vossensteyn et al., 2015), therefore counselling before enrolment appears to be a promising starting point to prevent prospective students from choosing a study field that does not suit them. In the online self-assessment (SA) presented here, we provide psychometric tests and questionnaires tailored to the specific requirements of several study fields. Users can test their fit to the desired field of study and receive feedback. The constructs our SA encompasses have been chosen based on a two-step construction process: In the first step, a literature review revealed constructs predictive of academic success in general (Richardson, 2011; Robbins et al., 2004; Schneider & Preckel, 2017). In a second step, we analyzed the field-specific requirements based on quantitative and qualitative surveys among students and lecturers. Evaluation results reveal that users feel well-informed and would recommend the SA to their peers. Further, validation studies show the instruments' high psychometric quality. Summing up, we reflect on framework conditions for evaluative research: This includes that university administrations provide access to study progress data to gain longitudinal insights into long-term effects of SAs.

Session N 6

25 August 2021 15:45 - 16:45

Session Room 12

Symposium

Teaching and Teacher Education

Students' cognitive and non-cognitive learning gains: The role of teaching and teacher competencies

Keywords: Achievement, Educational Psychology, Emotion and Affect, Mathematics, Motivation, Primary Education, Psychometrics, School Effectiveness, Secondary Data Analysis, Secondary Education, Social Aspects of Learning and Teaching, Student Learning, Teacher Effectiveness, Teaching/Instruction

Interest group: SIG 18 - Educational Effectiveness and Improvement

Chairperson: Alexander Naumann, Germany

Organiser: Alexander Naumann, Germany

Organiser: Dimitra Kolovou, University of Teacher Education St.Gallen, Switzerland

Discussant: Anneke Timmermans, University of Groningen, Netherlands

A central interest of educational research is to identify and capture factors that contribute to students' learning gains. Student learning gains refer not only to cognitive outcomes such as student achievement, but also to non-cognitive outcomes such as motivation or interest, which are gaining increasing attention as prerequisites for successful student learning. Building on this view, the symposium explores factors at the school and at the classroom level that affect various learning gains. The first paper investigates educational injustices. The key question is whether schools have an effect on the development of inequalities in cognitive and non-cognitive learning gains between grades 5 and 11. The second paper focuses on the convergent and predictive validity of three teaching quality measures—expert classroom observer ratings, teacher ratings, and student ratings—applying students' affective learning outcomes in mathematics as criterion. The third paper examines effects of teachers' knowledge of individual students' achievement, referred to as teachers' judgment accuracy, on students' achievement gains in mathematics and German language. The fourth paper investigates the instructional sensitivity of items assessing non-cognitive outcome measures in reading and science education. Key question is whether and to what extent items are capable of capturing effects of teaching. All presentations highlight ways to obtain empirical evidence about factors contributing to students' cognitive and non-cognitive learning, leading to effective learning and improvement of schooling and teaching. All papers will be discussed by a renowned expert in the field of educational effectiveness research regarding their implications for research and practice.

Are some schools less unjust than others?

Presenting Author:Luisa Grützmacher, University of Vienna, Germany; **Co-Author:**Svenja Vieluf, German Institute for International Educational Research (DIPF), Germany; **Co-Author:**Johannes Hartig, German Institute for International Educational Research (DIPF), Germany

Educational injustices are an important issue in educational discourses. One of these is correlations between social difference categories and learning gains, which have been shown to exist by many studies. Our school system is therefore unjust. However, is the whole school system equally unjust? There are few and mixed research findings. The aim of this study is to investigate whether schools differ with regard to the strength of correlations between social difference categories and learning gains. Besides cognitive outcome criteria (mathematical achievement, reading comprehension), non-cognitive outcome criteria are also considered (self-concept in mathematics/ reading, attitude towards reading, interest in mathematics, working behaviour in mathematics and German lessons). Also, two social difference categories are taken into account (socio-economic and migration background). The study is based on data from the longitudinal study KESS (Hamburg). The sample comprises data from 12,450 students in 172 secondary schools. Multi-level growth curve models were used for analysing the

random effects that social difference categories have on the learning gains and other outcomes of schooling. The results show that the size of effects of social difference categories on outcomes is the same across schools. These results suggests that schools do not compensate for inequalities in learning outcomes.

Ratings of Expert Classroom Observers, Teachers, and Students: Consistency and Predictive Validity

Presenting Author:Charalambos Charalambous, University of Cyprus, Cyprus; **Co-Author:**Sergios Sergiou, Department of Education, University of Cyprus, Cyprus

Recognizing the complexities of teaching, currently researchers are attending to multiple measures of teaching quality. Extending prior work, in this study we examine the convergent and predictive validity of three measures—expert classroom observer ratings, teacher ratings, and student ratings—by focusing on student affective learning in mathematics. Toward this end, we used data from Grade-4 and Grade-5 schoolchildren ($N=505$) and their teachers ($N=25$). The data derived from a teacher and a student survey including items carefully aligned to gauge the same content-generic or content-specific teaching aspects drawn from two widely recognized classroom observation frameworks. Classroom observation protocols associated with these frameworks were also used by expert observers to gauge teaching quality in six lessons per teacher. We examined the convergent validity of these measures by using Pearson correlations; using multi-level modeling (students nested within teachers), we compared their validity in predicting student learning in two affective factors yielded from another student survey administered at the beginning and end of the school year. Our analysis showed a range of correlations among the three measures; more critically, the pair of ratings showing the highest correlation varied depending on the teaching aspect examined. Furthermore, all three measures had no or very low predictive validity power. Collectively, these findings underline the need for more research geared toward better understanding how these three measures better capture certain aspects of teaching quality and the mechanisms through which these aspects might induce changes in student affective learning.

Relation of Teachers' Judgment Accuracy to Students' Achievement Gains in Mathematics and German

Presenting Author:Dimitra Kolovou, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Alexander Naumann, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Jan Hochweber, St. Gallen University of Teacher Education, Switzerland; **Co-Author:**Anna-Katharina Praetorius, Institut für Erziehungswissenschaft, Switzerland

Teachers' judgment accuracy is considered important for high quality teaching and student achievement gains over time. However, there is little empirical evidence supporting this assumption. Thus, the aim of our study was to investigate direct effects of judgment accuracy regarding student achievement on students' achievement gains in mathematics and German from the beginning to the end of secondary school (7th to 9th grade level). Data from 30 German language teachers ($N = 704$ students) and 30 mathematics teachers ($N = 663$ students) and their students in German-speaking Switzerland were analysed using longitudinal multilevel Rasch models with latent regression of (a) initial status and (b) change in classroom-level ability on teachers' judgment accuracy. The results showed that teachers' judgment accuracy did neither predict initial status nor change in classroom ability in the two subjects. Implications for future research on the effects of judgment accuracy are discussed.

Sensitivity of Non-Cognitive Outcome Measures to Effects of Teaching

Presenting Author:Alexander Naumann, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Burkhard Gniewosz, University of Salzburg, Austria; **Co-Author:**Jan Hochweber, St. Gallen University of Teacher Education, Switzerland; **Co-Author:**Johannes Hartig, German Institute for International Educational Research (DIPF), Germany

Today, non-cognitive outcomes like students' subject-related interest or intrinsic motivation receive increasing attention when evaluating the effectiveness of teaching. Valid inferences on teaching using such measures requires scales and items to be sensitive to classroom instruction. While the concept of instructional sensitivity receives increasing attention when it comes to assessments of students' achievement or competencies, instructional sensitivity so far has rarely been considered with respect to non-cognitive outcome measures, leaving the question open whether such measures are capable of capturing effects of teaching. Thus, we aim at (a) extending the concept of instructional sensitivity to non-cognitive outcome measures and (b) providing an approach for measuring corresponding Likert-items sensitivity. For illustration purposes, we reanalyze data from two studies addressing two different non-cognitive outcomes. In summary, we hope that our work helps fostering valid inferences on teaching effectiveness by raising awareness for this validity issue and enabling the identification of instructionally sensitive questionnaire items.

Session N 7

25 August 2021 15:45 - 16:45

Session Room 13

Symposium

Instructional Design

Young children's patterning competencies in relation to child and contextual factors

Keywords: Cognitive Development, Early Childhood Education, Informal Learning, Instructional Design, Mathematics, Special Education

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Nore Wijns, KU LEUVEN, Belgium

Discussant: Camilla Björklund, University of Gothenburg, Sweden

Recent empirical evidence points to the pivotal role of young children's patterning competencies for their later mathematical development, questioning the exclusive focus on basic numerical competencies in research and practice. The present symposium brings together four contributions on patterning and the association with other child and contextual factors, but each from a different theoretical and methodological perspective, and in different educational contexts. Bojorque et al. looked into preschoolers' repeating patterning ability and its association with early mathematical ability in a developing country, namely Ecuador. Wijns et al. longitudinally followed the repeating patterning, growing patterning and numerical ability of Flemish 4- to 6-year-olds and evaluated the direction of the association between these three abilities in this young age group. Lüken observed German preschoolers in their free-play and examined self-initiated pattern creations in relation to the materials that were provided in that free-play context. Finally, Werner et al. explored the possibility of repeating patterns that are presented spatially (i.e., in two dimensions), which might be easier to process for visually-oriented children (e.g., deaf children), and which, therefore, might contribute to more inclusive learning opportunities. Together, the diversity of topics related to patterning addressed in this symposium will broaden and deepen the current insights in the development and stimulation of early patterning, and provide relevant insights for the organizational stakeholders that shape early mathematics education. The discussant, Camilla Björklund will reflect upon these insights and implications for education from her expertise on early mathematical development in general, and patterning more specifically.

Ecuadorian 4-5-year-olds patterning competencies and their association with mathematical abilities

Presenting Author:Gina Bojorque, Universidad de Cuenca, Ecuador; **Co-Author:**Neli Gonzales, Universidad de Cuenca, Ecuador; **Co-Author:**Nore Wijns, KU Leuven, Belgium; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium; **Co-Author:**Joke Torbevens, KU Leuven, Belgium

Young children's early repeating patterning abilities are important foundations for their later mathematical development. Current insights into young children's repeating patterning abilities and their association with children's mathematical development are exclusively based on studies conducted in developed countries. Taking into account the differences in economic, societal and educational characteristics between developed versus developing countries, these insights cannot be generalized to children from developing countries. We addressed this gap by analyzing (a) the repeating patterning performance and errors of 4- to 5-year-olds, and (b) their association with these children's early mathematical abilities, in a developing country, Ecuador. Sixty preschoolers and 56 kindergartners completed a repeating patterning test (addressing their ability to extend and generalize repeating patterns, and to identify the repeating patterning unit) and an early mathematics test (addressing number and arithmetic abilities) at the end of the school year. Results first indicated rather low repeating patterning performances of both preschoolers and kindergartners, with large inter-individual differences in these performances. Kindergartners had significantly better patterning abilities than preschoolers. Second, error analyses revealed that children made different types of errors when solving the patterning tasks. The

majority of errors were pattern-related errors. Preschoolers made more errors than kindergartners. Third, patterning abilities were positively associated with early mathematical abilities in both grades. These results complement current theoretical models of young children's mathematical development and inform educational policy and practices in this domain for developing countries.

Associations between patterning and numerical ability in 4- to 6-year olds

Presenting Author:Nore Wijns, KU Leuven, Belgium; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium; **Co-Author:**Bert De Smedt, KU Leuven, Belgium; **Co-Author:**Joke Torbevens, KU Leuven, Belgium

Researchers have recently started to investigate the association between children's patterning ability and their numerical ability. The present study extends this research by investigating the direction of this association in early childhood, and distinguishing two types of patterns, namely repeating (e.g., □△□△□△) and growing patterns (e.g., □△□□△□□□△). Participants were 410 children who were annually assessed on their repeating patterning, growing patterning, and numerical ability, at age four, five, and six (i.e., spring 2017, 2018, and 2019). Repeating and growing patterning ability were both measured by means of three activities (i.e., extending, generalizing, identifying the structure), whereas numerical ability covered performance on eight aspects of early numerical ability, including number recognition and number comparison. A cross-lagged panel model identified bidirectional associations between all three abilities from age four to five, while taking into account spatial skills. From age five to six, both patterning abilities predicted later numerical ability, but the reverse was no longer true. Associations between performances on both pattern types also disappeared between age five and six. Results highlight the unique associations between repeating patterning, growing patterning, and numerical ability, above spatial skills, in early childhood, and suggest that early patterning ability supports later numerical ability.

Patterning during free play – different materials prompt different mathematical structures

Presenting Author:Miriam Lüken, Bielefeld University, Germany

In play-based early childhood settings, children self-initiate mathematical activities like creating arrangements with shapes, solids, and everyday objects. Some of these creations are mathematical patterns. In this observational study, we look at the role of material in creating different types of patterns. 492 creations made by young children during free play were categorized and analyzed according to material. We found that pattern blocks were most often used for creating and that all different pattern types were created with pattern blocks. No patterns were found in creations with e.g. buttons. The results can help early childhood educators in choosing suitable material for different patterning experiences in play-based settings.

Development of a repeating patterning test from a bimodal perspective

Presenting Author:Viktor Werner, Universität Hamburg, Germany; **Co-Author:**Hänel-Faulhaber Barbara, Universität Hamburg, Germany

When children enter school, they have already developed a strong understanding of repeating patterns that relates to their mathematical skills (e.g., Rittle-Johnson et al. 2019). Typically (e.g., Wijns et al. 2019), a repeating pattern is displayed linearly (i.e., in one dimension). Visually oriented children (e.g., deaf children), however, are able to process information better if it is displayed in a spatial (i.e., two-dimensional), rather than in a linear fashion (e.g., Zarfaty et al. 2004). A pattern format was developed where the elements of a repeating pattern are positioned in a circle. In addition to the conventional linear pattern format, the suitability of this new spatial format of repeating patterns was assessed for different patterning activities (i.e., copying, extending, translating, and repairing) in young primary school children. Preliminary analyses suggest that children can operate correctly and effectively with both pattern formats. These findings open up possibilities for children with different approaches to patterning activities.

Session N 8

25 August 2021 15:45 - 16:45

Session Room 7

Symposium

Instructional Design

What counts? Picture book characteristics in the domain of early mathematics

Keywords: Early Childhood Education, Instructional Design, Mathematics, Teaching/Instruction

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Colleen Uscianowski, University of Cincinnati, United States

Organiser: Joke Torbevens, KU LEUVEN, Belgium

Organiser: Colleen Uscianowski, University of Cincinnati, United States

Discussant: Esther Brunner, Pädagogische Hochschule Thurgau, Switzerland

Cumulative evidence points to the effectiveness of shared picture book reading in young children's early language and literacy development. Recently the potential of picture books for improving the acquisition of early mathematical competencies was also established. Research in the literacy field indicates the importance of the quality of picture book characteristics and qualitative adult-child interactions in function of this effectiveness. Insights into significant picture book characteristics in the domain of mathematics and their association with current educational practices and child outcomes are almost non-existent. This symposium, bringing together researchers from five different countries, aims to fill this gap via four empirical studies and one discussant contribution. All empirical studies focus on shared picture book reading in the domain of mathematics with children in the preschool age (i.e., < age 6). They complement each other by analyzing this topic from different perspectives, i.e., by defining the content and structural features of frequently used picture books in different countries (Splinter, Uscianowski), by studying preschool teachers' awareness of and competence in using these features (Elia), and by investigating children's picture book interactions on the basis of these features (Palmér). Esther Brunner, expert in teacher training in the domain of early mathematics, critically discusses their complementary findings in view of theoretical implications and optimizing current early mathematics education practices. Collectively, the studies aim to uncover the picture book characteristics that may support children's mathematical learning and demonstrate the significance of these features on shared reading practices.

An opportunity for math learning: A feature analysis of math language in popular children's books

Presenting Author:Colleen Uscianowski, University of Cincinnati, United States

Despite evidence that shared reading interactions influence children's early math development, there is little research on the features of picture books that may be conducive for learning. Analyzing these features may help teachers and parents understand how to best optimize picture books as a tool in the child's math learning environment. In particular, the math language in picture books is one feature that may help improve children's knowledge of mathematics and ability to explain their math thinking. This study explores the textual features of 50 popular children's books in order to find opportunities for math learning in books that were not explicitly written to teach mathematics. The amount, variation, and complexity of math language related to number and operations, shape and spatial relations, and measurement were coded. Findings indicate that shape and spatial relations words were most prevalent, while number and operations and measurement words were present in smaller and equal proportions. Words related to shape and spatial relations were also generally more complex than words in the other domains, indicating that popular picture books may be a beneficial source of input related to geometric and spatial language. Results demonstrate that even non-explicit math picture books can be a source of math exploration in the preschool years and should be an integral part of early education.

Young children's mathematical picture books: content and structural features

Presenting Author:Suzanne Splinter, Katholieke Universiteit Leuven, Belgium; **Co-Author:**Emke Op 't Eynde, KU LEUVEN, Belgium; **Co-Author:**Fien Depaepe, KU Leuven, Belgium; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium; **Co-Author:**Joke Torbevens, KU Leuven, Belgium

Cumulative evidence confirms the potential of shared picture book reading for stimulating young children's mathematical development. In contrast to the domain of early literacy, little is known about the learning-supportive characteristics of picture books in the domain of mathematics, and their contribution to shared reading activities. We aimed to address this gap by analyzing the content and structural features of mathematical picture books, using the framework of Ward

and colleagues (2017). Fifty-three publicly available picture books that were written with the purpose to stimulate the development of 3-5-year-olds' counting and number competencies were analyzed. Results revealed that approximately half of the picture books included the 1-10 number range, most often arranged in an ascending order, and with numbers being evenly frequently represented as Arabic numerals, number words, or sets to be counted. Picture books hardly paid attention to counting principles, ordinality, and basic mathematical operations. Many picture books depicted features that are assumed to hinder young children's counting and number competencies, for example, showing many visual distractors among sets to be counted and presenting items of sets in inconsistent ways. In general, we found hardly any differences in the content and structural features of story-based books versus books without stories. Together, our findings point to both facilitating and obstructing features of picture books for stimulating young children's early counting and number development. These findings provide building blocks for future studies in the domain, and for selecting and designing mathematical picture books.

Teachers' awareness of the learning-supportive characteristics of picture books in early mathematics

Presenting Author:Illiada Elia, University of Cyprus, Cyprus; **Co-Author:**Van den Heuvel-Panhuizen Van den Heuvel-Panhuizen, Utrecht University, Netherlands & Nord University, Norway, Norway; **Co-Author:**Dag Madsen, Nord University, Norway; **Co-Author:**Eleni Deliyianni, Cyprus Ministry of Education, Culture, Sports and Youth, Cyprus; **Co-Author:**Cathrine Bjerknes, Nord University, Norway

Shared picture book reading creates an environment for kindergarten children in which they can gain informal mathematical experiences. Recent studies have provided evidence about the power of picture books to support children's early mathematical development. However, teachers' awareness of picture book characteristics and their competence in using these characteristics to elicit children's mathematical thinking and support children's mathematical learning are issues that have received limited attention. The present study investigates kindergarten teachers' awareness of, and competence in, the use of the learning-supportive characteristics of picture books in mathematics education for young children. Specifically, the focus is on whether a framework developed for identifying learning-supportive characteristics of picture books contributes to improving this awareness and competence. This is researched for two wordless picture books. The teachers involved are asked to identify and evaluate the learning-supportive characteristics of picture books both with and without the use of this framework by filling in for each book two times a questionnaire. To explore the generality of the contribution of the framework on teachers' awareness and competence, the study is carried out in two countries, Cyprus and Norway.

The role of mathematical content-related interaction in shared picture book reading

Presenting Author:Hanna Palmér, Linnaeus University, Sweden; **Co-Author:**Camilla Björklund, University of Gothenburg, Sweden

In this presentation, we focus on a study of how content-related interactions between teachers and children during shared picture book reading relate to children's reasoning about numbers. A picture book was specifically designed to create the best learning-supportive conditions for children to discern numbers and initiate numerical reasoning. In an educational design research study, two ways of interacting during shared picture book reading were explored. First teachers were instructed not to intentionally direct the child's interest towards the mathematics (or any other content) in the book, allowing to analyze the spontaneous interactions on the basis of only picture book features. Afterwards teachers were instructed to act in order to extend the reasoning about the content. Nineteen 3-5-year-olds and three teachers participated in video-observed individual shared reading sessions. Based on these observations, the interaction between teacher and child in the shared reading sessions seems to be critical for what kind of reasoning the book readings may entail. Even though the pictures in the book were designed to draw attention to different aspects of numbers, number relations were not spontaneously a primary object of attention for children. The results give strong support for the necessity of teachers' engagement in children's initiatives, as well as for teacher-initiated talk, as both had great impact on children's reasoning in qualitative and quantitative terms. Preschool teachers' support in transforming empirical clues into mathematical representations and comparisons seems critical for more advanced reasoning about numbers to occur.

Session N 9

25 August 2021 15:45 - 16:45

Session Room 17

Symposium

Teaching and Teacher Education

Teachers' and teacher educators' evidence-informed practice: Takeaways for teacher education

Keywords: Attitudes and Beliefs, Comparative Studies, Higher Education, Mixed-method Research, Pre-service Teacher Education, Qualitative Methods, Quantitative Methods, Reasoning, Survey Research, Synergies between Learning; Teaching and Research, Teacher Professional Development

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Christina Wekerle, University of Augsburg, Germany

Organiser: Christina Wekerle, University of Augsburg, Germany

Discussant: Christof Wecker, Universität Hildesheim, Germany

Teachers are increasingly asked to not only ground their actions on experience, but also on evidence from educational research, which has been called evidence-informed (or -based) teaching (Sharples, 2013). To successfully prepare teachers for evidence-informed teaching, we need evidence that addresses prerequisites and challenges of all relevant stakeholders in that respect: pre-service teachers, in-service teachers, teacher educators and educational researchers. Thus, this symposium focuses on evidence-informed teaching from different stakeholder perspectives and aims at drawing conclusions for how to best support them. In a representative national survey, the first contribution investigates to which degree in-service teachers draw on different sources when making classroom decisions and argues for a combination of professional development and school-improvement strategies. The second contribution addresses teacher educators' attitudes and perceived challenges regarding evidence-based practice by means of a latent profile analysis and identifies different subgroups, which might have to be differentially supported. Contribution 3 takes a closer look at teacher educators' perceived facilitators and barriers to evidence-based practices based on qualitative interviews and points to workload and researcher-teacher educator collaborations as key factors. Finally, contribution 4 compares pre-, in-service teachers' and educational researchers' evidence-informed reasoning about a classroom scenario via think aloud and interview analyses to better understand pre-service teachers' possible trajectories. The authors stress the importance of making pre-service teachers see connections between specific classroom situations and more abstract academic concepts. The session will close with a discussion by Christof Wecker. Sharples, J. (2013). *Evidence for the Frontline*. Alliance for Useful Evidence. <http://www.alliance4usefulEvidence.org/assets/EVIDENCE-FOR-THE-FRONTLINE-FINAL-5-June-2013.pdf>

Why initial teacher training is only part of the solution... (CANCELLED)

Presenting Author:Julie Nelson, National Foundation for Educational Research (NFER), United Kingdom; **Co-Author:**Matthew Walker, National Foundation for Educational Research (NFER), United Kingdom

THIS PAPER HAS BEEN CANCELLED FOR PRESENTATION.

There is international recognition that evidence-informed teaching (EIT) can transform teaching and learning. In England, key infrastructure developments include the establishment of the Education Endowment Foundation (EEF) as the 'What Works Centre' for education and the launch of the Chartered College of Teaching and the Research Schools Network, which both support EIT. There have also been reforms to the national frameworks for initial (pre-service), early-career, and continuing, teacher development. Our presentation explores the likely impact these developments will have on EIT. Drawing primarily on data from a nationally representative survey of 1,670 teachers and school leaders in England undertaken in 2017, our research suggests there is often a disconnect between *provision for*, and the *adoption of*, EIT. We found that while teachers were very likely to draw on their own, or other teachers', expertise and research when making decisions, academic research played only a small part. In recent qualitative research we also found that many school leaders struggled to assert their role as leaders of learning, and that this often led to short-term responses rather than strategic or evidence-informed planning. These findings indicate that there is still some way to go before we will see an embedding of EIT right across the profession. Senior leaders did not always pause to accurately diagnose their schools' needs, nor did appropriate evidence-informed action always follow diagnosis. This highlights the critical importance of developing school leaders,

as well as pre-service and serving teachers, in order to realise EIT at system level.

Teacher educators as central agents in an evidence-based practice agenda: A latent profile analysis

Presenting Author:Annika Diery, Technical University of Munich (TUM), Germany; **Co-Author:**Maximilian Knogler, Technical University of Munich (TUM), Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany

University-based teacher education has been tasked with addressing the gap between research and teaching and to promote their closer alignment in terms of evidence-based practice. University-based teacher educators are seen as central agents in supporting evidence-based practice among future teachers. To better understand and design appropriate support for this diverse group of professionals, research needs to examine the relevant characteristics of teacher educators concerning the support of evidence-based practice. An online survey study with 484 university-based teacher educators was conducted to examine attitudes and perceived challenges regarding evidence-based practice. Latent profile analysis revealed five significantly different subgroups: high-challenges, no-challenges, knowledge- & resource-challenges, resource-challenges, and skeptical profile. Importantly, profiles partly differed in their reported use of evidence in their teaching. To ensure the quality of teacher education, teacher educators must be supported in their mission with regard to crucial personal characteristics in terms of attitudes and perceived challenges.

From research evidence to teaching action: Teacher educators' views of evidence-informed practice

Presenting Author:Despoina Georgiou, Utrecht University, Netherlands; **Co-Author:**Sog Yee Mok, University of Zurich, Switzerland; **Co-Author:**Cui Ping, Eindhoven University of Technology, Netherlands; **Co-Author:**Tina Seidel, Technische Universität München, Germany

Recent national and institutional policies in Europe encourage teacher educators to increase the implementation of evidence-based teaching practices (EBT) in university coursework. Yet there is little attention to what teacher educators believe and experience about the implementation of EBT. This study aims to describe teacher educators' perceptions of EBT and provide a deeper understanding of any barriers or problems encountered in the implementation of EBT practices. Facilitating factors to foster the implementation of EBT practices are also discussed. Semi-structured interviews were conducted with 12 teacher educators who work in various teacher education programs in Germany. Thematic analysis was used to analyze the data. The results indicate that although teacher educators believe in the importance of EBT they still feel challenged to translate research evidence into their teaching practice. Strong barriers to the implementation of EBT that emerged in the present study were time pressure, difficulty to identify the best available evidence, and a lack of professional development programs in this field. Implications about the role of university structures and future steps that are necessary to increase the implementation of EBT practices in teacher education will be discussed.

Contrasting pre-, in-service teachers' and educational researchers' evidence-informed reasoning

Presenting Author:Christina Wekerle, University of Augsburg, Germany; **Co-Author:**Katharina Kiemer, Universität Augsburg, Germany; **Co-Author:**Kai Wagner, Saarland University, Germany; **Co-Author:**Kati Trempler, University of Wuppertal, Germany; **Co-Author:**Martin Greisel, University of Augsburg, Germany; **Co-Author:**Theresa Wilkes, Saarland University, Germany; **Co-Author:**Robin Stark, Saarland University, Germany; **Co-Author:**Ingo Kollar, University of Augsburg, Germany

Teachers are increasingly asked to base their classroom-related decisions on evidence derived from educational research. However, research suggests that pre-service teachers rarely follow a structured reasoning process and tend to refer to experiential than to academic knowledge when being confronted with problematic classroom situations. Thus, pre-service teachers should receive instructional support in reasoning about classroom-related challenges. We argue that such an intervention should be informed by comparative research on pre- and in-service teachers' and educational researchers' reasoning. We asked $N = 55$ pre-service teachers, in-service teachers and educational researchers to think aloud about a written classroom scenario and participate in a retrospective interview on their reasoning processes. Educational researchers conceptualized problematic classroom events more often than pre- and in-service teachers, but did not differ on a number of other reasoning activities. However, educational researchers significantly more often referred to academic knowledge and significantly less often to experiential knowledge than pre- and in-service teachers. Pre- and in-service teachers differed from each other neither with respect to their reasoning processes nor with respect to their use of scientific or experiential knowledge. These quantitative results are complemented by qualitative analyses of participants' reasoning in each of the three groups. Finally, implications for the design of interventions to support pre-service teachers' evidence-informed reasoning are discussed.

Session N 10

25 August 2021 15:45 - 16:45

Session Room 3

Symposium

Culture, Morality, Religion and Education

Students' values of tolerance and citizenship – Results from ICCS 2016

Keywords: Attitudes and Beliefs, Citizenship Education, Cultural Diversity in School, Culture, Quantitative Methods, Social Interaction

Interest group: SIG 13 - Moral and Democratic Education

Chairperson: Johanna Fee Ziemes, University of Duisburg-Essen, Germany

Organiser: Johanna Fee Ziemes, University of Duisburg-Essen, Germany

Discussant: Katrin Hahn-Laudenberg, University of Wuppertal, Germany

Societies all over Europe are changing due to multiple factors. Among them are migration movements and the reactions of societies and politics reacting to them. In multiple countries a rise of intolerant backlash can be identified (Foa & Mounk, 2016; Norris & Inglehart, 2019). School has the opportunity and task to prepare students with and without immigration backgrounds for their role as citizens in democracies (Banks, 2008, 2015) and foster tolerance. In democracies, this includes active conceptualisations of citizenship and the support of pluralistic values. In this symposium, European data from the International Civic and Citizenship Education Study 2016 (ICCS 2016) is used to explore and explain which aspects of schooling may be suitable to foster tolerance and how tolerance interacts with different notion of students' citizenship. ICCS 2016 encompasses data from over 50,000 students in 15 educational systems within Europe. The first presentation examines the interaction of students' immigration background with their conceptualisation of citizenship, while the second analyses the role of values for students' ideas of citizenship. The third lecture investigates the role of variables of schooling for the prediction of students' tolerance. Combined, the analyses provide insights for scholars and educators concerning students' preparedness as emerging citizens.

Citizenship Norms Among Native and Immigrant Students From A European Perspective

Presenting Author:Maria Magdalena Isac, KU LEUVEN, Belgium; **Co-Author:**Ellen Claes, KU Leuven, Belgium; **Co-Author:**Andres Sandoval-Hernandez, University of Bath, United Kingdom

The unprecedented diversity in student populations in Europe resulting from the recent rapid influx of migrants, refugees and asylum seekers is an important challenge to implementing inclusive citizenship education across Europe. Current European policy frameworks in education stress that citizenship education needs to promote common attitudes and values in the entire student population while respecting cultural diversity. Nevertheless, existing research on citizenship education tends to give only a fragmented picture. More research is needed to systematically address potential attitudinal differences between groups of students defined by migration background. To this end, this study analyzes potential differences in citizenship norms between immigrant and native-born students across 9 European countries participating in ICCS 2016. More specifically, using multiple group multinomial logistic regression analyses, it investigates the relationship between immigration status and citizenship norms, while taking into account other individual level characteristics, such as gender, socioeconomic status and civic knowledge. The study reveals that in most of the countries native-born and immigrant students tend to endorse similar configurations of citizenship norms. When differences in adherence exist (in 4 countries), the most solid finding indicates that immigrant students are more likely to hold comprehensive citizenship norms when compared to their native-born peers. The results may be used to inform future studies and initiatives aimed at

identifying and understanding the motivations behind endorsing different configurations of citizenship norms among different groups of students.

Citizenship Norms and Tolerance in European Adolescents

Presenting Author:Andres Sandoval-Hernandez, University of Bath, United Kingdom; **Co-Author:**Ellen Claes, KU Leuven, Belgium; **Co-Author:**Nicola Savvides, University of Bath, United Kingdom; **Co-Author:**Maria Magdalena Isaac, KU LEUVEN, Belgium

Within Europe, numerous political, economic, social and cultural changes brought about by globalization and Europeanization have challenged and transformed young peoples' sense of citizenship and identity. An important aspect of good citizenship is attitudes of tolerance and support for the equal rights of others. Yet, in recent times, there has been a rise in the levels of intolerant and xenophobic attitudes, due, in part, to negative perceptions over increasing flows of migration, immigration, refugees and asylum seekers. In this study, multiple group multinomial logistic regression models are estimated to determine how different profiles of citizenship norms (i.e. comprehensive, socially engaged, duty-based, monitorial, and anomic) relate to European adolescents' political tolerance, i.e. their attitudes towards equal rights of others (immigrants and women). Data from ICCS 2016 study, including 51,040 grade 8 students (aged 14) across 14 European countries was used. The study reveals two clear patterns; First, students classed within the comprehensive citizenship profile deal well with the ambivalence present in the definition of tolerance, especially regarding equal rights for immigrants. Second, students within the other citizenship profiles (socially engaged, duty-based, monitorial and anomic) show significantly lower support for equal rights for immigrants than the students classified as comprehensive. The findings contribute toward understanding the mechanisms underpinning citizenship norms profiles and their relationship to attitudes toward others. The results may be used to inform targeted intervention policies for the promotion of tolerance in Europe.

Which aspects of schooling are suitable to foster tolerance among adolescents?

Presenting Author:Johanna Fee Ziemes, University of Duisburg-Essen, Germany; **Co-Author:**Hermann J. Abs, University of Duisburg-Essen, Germany

To persist pluralist democracies depend upon the mutual acknowledgement that everyone has the equal right to participate in political process h. This acknowledgement can be described as tolerance. Schools may have the opportunity to decrease group-based enmity and foster tolerance in students. Weighted data from the ICCS 2016 are used to identify the role of different aspects of schooling to predict tolerance among students. In a first step, data from Germany is employed, in a second step the results are generalised on the European level. While civic knowledge proves to be the strongest predictor of tolerance, a discursive classroom climate turns out to be predictive for both, knowledge and tolerance. Further, the social school climate can be shown to be a potent predictor of tolerance. The results imply that schools have multiple avenues to foster tolerance among students.

Session N 11

25 August 2021 15:45 - 16:45

Session Room 6

Symposium

Cognitive Science

Problem solving - effects of children's interindividual competences and pedagogical approaches

Keywords: Cognitive Development, Cognitive Skills, Early Childhood Education, Inquiry Learning, Language (Foreign and Second), Problem Solving, Science Education, Self-regulation

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Anke Maria Weber, University of Koblenz-Landau, Germany

Organiser: Anke Maria Weber, University of Koblenz-Landau, Germany

Discussant: Samuel Greiff, University of Luxembourg, Luxembourg

Problem solving results in the transition from one state to another through the use of higher mental functions such as planning and reasoning and relates to problems with a single solution or problems with multiple solutions (Reed, 2017). Few studies have investigated the way young children solve problems with a single solution, and even fewer examined young children's processing of problems with multiple solutions. Interindividual competences such as language, executive functions, intelligence, and knowledge may affect young children's problem solving processes and outcomes. Moreover, pedagogical approaches are of interest when considering fostering problem solving competences of young children. Paper 1 examines differences in problem solving between monolingual and bilingual children in a problem with a single solution. Paper 2 reports children's problem solving competences in a problem with multiple solutions and its relation with intelligence and content-knowledge. Paper 3 investigates the impact of an enriched preschool environment on children's emerging problem solving performance. Paper 4 focuses on the effect of online and offline inquiry skills on problem solving as a part of children's experiment design and the relation with content and procedural knowledge. These perspectives expand our understanding of how children solve problems and what competences and pedagogical factors influence their problem solving competences.

Verbal processes and mental effort in bilingual and monolingual children's planning performance

Presenting Author:Susanne Enke, University of Leipzig, Germany; **Co-Author:**Catherine Gunzenhauser, University of Freiburg, Germany; **Co-Author:**Julia Karbach, University of Koblenz-Landau, Germany; **Co-Author:**Henrik Saalbach, University of Leipzig, Germany

In problem solving, transitioning from one state to another can be accomplished by mentally planning ahead. Planning can thus be seen as an important part of problem solving. Requiring the integration of several executive function components, planning performance is also an important predictor for academic success. Prior research suggests that planning performance itself may be influenced by the use of self-directed speech. Another line of research revealed that children growing up with more than one language might differ from monolingual children with respect to the use of self-directed speech and exerted mental effort on tasks requiring executive functions. In the present study, we thus aimed at examining whether or to what extent monolingual and bilingual children differ in terms of mental effort and the role of verbal processes during planning. German speaking monolinguals ($n = 33$, $M_{age} = 8.78$) and German-Russian speaking bilinguals ($n = 34$, $M_{age} = 8.88$) completed the *Tower of London* task which was preceded by a planning phase. We found that monolingual students' but not bilingual students' planning performance was impaired by an additional verbal task relative to a motor control task, suggesting a differential use of self-directed speech in both groups. Linear regressions revealed that after controlling for nonverbal intelligence, language competencies and performance accuracy, bilinguals exerted significantly less mental effort in a planning task than their monolingual peers. Further results and implications will be discussed.

Preschool Construction Play as a Means to Enhance Problem Solving and Self-Regulation Capabilities

Presenting Author:Ornit Spoktor-Levy, Bar-Ilan University, Israel; **Co-Author:**Taly Shechter, Bar-Ilan University, Israel

Children spend a lot of time planning and problem solving as they study their environment. These behaviors can be considered precursors of engineering thinking. There are plenty of opportunities in preschool classrooms for engineering processes. Thus, the objective of this intervention study was to examine how enriching the preschool learning environment with diverse construction materials for six months (intervention group), impacts the performances of problem solving (one of the six Engineering Habits of Mind – EHOM; Lucas, Hanson & Claxton, (2014.) and self-regulation capabilities of preschoolers (age 5-6 years) in a problem-solving construction task. The study comprised 228 children (108 girls), applying a mixed method approach. The main research tool was open-ended LEGO® problem-solving (bridge building) construction task. All participants' responses (verbal and non-verbal) and their problem-solving processes (pre-post) were video-recorded (after obtaining parental consent). Micro-analyses of the videos using a detailed scoring scheme were conducted. Data were also collected from classroom observations. Results show significant improvement, in the intervention compared to comparison group, in the total measure of EHOM, self-regulation capabilities, problem-solving in a transfer task (construction task with unfamiliar material) and in the quality of the product (bridge's length, height, stability, complexity). The qualitative data were consistent with the quantitative results. To conclude, preschoolers improve their problem-solving, EHOM and self-regulatory capabilities when they actively engage, daily, with construction in their learning environments enriched with diverse and inspiring construction materials.

Examining 5- to 7-year-old children's testing and optimizing with a gear engineering task

Presenting Author:Timo Reuter, University of Koblenz-Landau, Germany; **Co-Author:**Miriam Leuchter, University of Koblenz - Landau, Germany

Introducing 5- to 7-year-old children to the engineering design process (EDP) is an important objective of early STEM education. Studies indicate that young children often miss the crucial steps of testing and optimizing during the EDP. The present study explores how children's goal awareness, self-evaluation ability, task persistence, domain-specific content knowledge, spatial skills and intelligence relate to their testing and optimizing behavior and to the solution quality. In a standardized procedure, 41 children worked on a well-defined engineering design task in the context of gears. The engineering process was videotaped, children's testing, optimizing, solution quality, goal awareness, self-evaluation, and task persistence was rated with a coding scheme and with interviewer questions. Contend knowledge, mental rotation ability and figural reasoning were measured with standardized tests. Most of the children showed at least one indication of testing or optimizing. However, less than half of the children made changes to a completed prototype, even when asked to do so. Correlational analyses indicated that testing and optimizing was positively related to task persistence and outcome quality. Outcome quality was positively related to goal awareness. Moreover, children's self-evaluation was negatively related to task persistence. Our findings suggest that 5- to 7-year-olds can meaningfully engage in the EDP with well-defined problems. However, most children are satisfied with their first solution and lack realistic self-evaluation. Moreover, they require support to retrieve the goal specifications.

The Association of Offline and Online Inquiry Skills with Conceptual and Procedural Knowledge

Presenting Author:Joep van der Graaf, Radboud University Nijmegen, Netherlands

Inquiry-based learning fosters acquisition of domain knowledge and inquiry skills. While the bidirectional relationship between inquiry skills and domain knowledge has been established, more research is needed to compare offline with online inquiry measures, and conceptual with procedural knowledge. Therefore, the present study aimed to provide more insight into the bidirectional relationship between knowledge and inquiry. A digital inquiry-based lesson about gears was used. Offline inquiry skills (hypothesis generation/evidence evaluation and experimentation) were assessed with a questionnaire. Conceptual and procedural knowledge about gears were assessed before and after the inquiry-based lesson using questionnaires. During the inquiry-based lesson, online measures of inquiry (hypothesis generation and experimentation) were collected using log data. Results showed that offline and online measures of inquiry skills were partially related. Prior procedural knowledge was associated with online hypothesis generation and experimentation. Finally, online hypothesis generation related to learning of procedural knowledge of gears' turning speed and online experimentation to learning of procedural knowledge of gears' turning direction. These results align with previous research, and add that online measures of inquiry-based learning appeared to be better explain learning of domain knowledge than offline measures, and that procedural and conceptual knowledge might contribute differently to inquiry-based learning.

Session N 12

25 August 2021 15:45 - 16:45

Session Room 5

Symposium

Instructional Design

Effectiveness of Teaching: Does Task-Design matter?

Keywords: E-Learning/Online Learning, Educational Psychology, Experimental Studies, Instructional Design, Teaching/Instruction

Interest group: SIG 06 - Instructional Design

Chairperson: Leonie Jacob, University of Tübingen, Germany

Organiser: Leonie Jacob, University of Tübingen, Germany

Organiser: Andreas Lachner, University of Tübingen, Germany

Discussant: Logan Fiorella, University of Georgia, United States

Learning by teaching previously learned contents to others is considered an effective instructional activity to enhance comprehension. Recent studies documented that also teaching to *fictitious* others resulted in substantial learning outcomes. The effects, however, varied considerably among studies, indicating that distinct boundary conditions constrain the effectiveness of learning by teaching to fictitious others. Prior research rarely considered boundary conditions as potential moderators of learning by teaching. In this symposium, we aim at closing this research gap. A coherent set of four presentations will shed light on task-related boundary conditions of learning by teaching, and particularly focus on the degree of social presence during teaching and the teaching modality. Together, the symposium contributes to a better understanding of the underlying mechanism of learning by teaching to fictitious others and provides empirical evidence under which conditions learning by teaching is effective.

Learning-by-Teaching: Testing the Social-Presence Hypothesis by Manipulating Audience Size

Presenting Author:Vincent Hoogerheide, Utrecht University, Netherlands; **Co-Author:**Andreas Lachner, University of Tübingen, Germany; **Co-Author:**Leonie Jacob, University of Tübingen, Germany; **Co-Author:**Inga Glogger-Frey, University of Freiburg/Department of Psychology, Germany; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands; **Co-Author:**Alexander Renkl, University of Freiburg, Germany

A recent study found that teaching the content of a worked example to a fictitious student on camera enhanced problem-solving performance compared to studying an example, replicating prior research with conceptual material. It is unclear which mechanisms are responsible for the teaching on video effect. The social-presence view posits that learning-by-teaching's effectiveness depends on students' awareness of the audience during teaching. Social-presence could influence the effectiveness of learning-by-teaching by determining the arousal students experience and the (meta)cognitive processes they engage in during teaching. This study aimed to replicate the teaching on video effect with problem-solving material and to test the social-presence view by manipulating the size of the audience students teach to. University students ($N=115$) either studied a worked example (Study Condition) or explained the example to an audience of one person (Small Audience Condition) or four people (Larger Audience Condition). Participants completed an immediate and delayed problem-solving posttest. Effects on perceived arousal, perceived effort, and metacognitive processing were explored. Results unexpected showed that teaching was not more conducive to problem-solving performance than studying. Teaching a larger audience was even less efficient than studying, as equal performance was attained with higher perceived effort investment in the posttests. The audience conditions reported more effort and negative arousal during the experimental manipulation than the study condition, and both audience conditions showed similar levels of (meta)cognitive processing. These findings suggest that teaching examples does not foster problem-solving performance and that high social-presence learning-by-teaching situations might best be avoided.

Does Inducing Social Presence Enhance the Effectiveness of Teaching in Written Form?

Presenting Author:Leonie Jacob, University of Tübingen, Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany; **Co-Author:**Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany

Learning by teaching to fictitious others is regarded as a beneficial strategy to enhance comprehension. Previous research provided evidence that the positive effects largely depend on teaching modality as students showed higher learning outcomes when they taught orally than when in written form. In line with the social presence view, the beneficial effect of oral teaching might be due to higher levels of perceived social presence during teaching orally. Therefore, we investigated whether we could aid learning by teaching in written form by inducing social presence during teaching. We conducted a study with university students ($N = 137$) who first studied a text about immunology. Afterwards, they randomly taught the contents orally to a fictitious peer or in written form by means of a plain text-editor. We implemented a further writing condition in which students wrote the explanation in a messenger chat inducing higher levels of social presence of the fictitious peer. A control group retrieved the materials. Results showed no differences regarding learning outcomes among conditions. Interestingly, teaching was more effortful, enjoyable, and interesting than retrieving. This study demonstrates that although learning by teaching increases motivation, the motivational advantages do not pay off in more learning. Furthermore, they indicate that solely increasing social presence does not improve learning by written teaching and highlight the need for more instructional support during teaching.

Modality Transfer: Instructional Implications for e-Learning by Teaching – a Field Study

Presenting Author:Tobias Mannhart, University of Regensburg, Germany; **Co-Author:**Silke Schworm, University of Regensburg, Germany

The influence of modality in e-learning by teaching tasks has been an important factor in current research. One important aspect that has not yet been sufficiently investigated is whether the combination and interrelation of input and output media plays a role in addition to individual effects of the modality. Therefore, we ask the question in this exploratory field study whether a change of modality as part of a learning by teaching instruction results in improved learning outcomes. We also ask to what extent video explanations created by learners differ from written explanations, and how any differences manifest. 27 participants working in in-company training took part in the study. They created textual and audio-visual learning material for peers from text and video inputs. Results of the 2x2-within-pretest-posttest-design indicate that producing text is just as fruitful for learning outcomes as producing video. The data also indicates that a modality transfer from textual input to video output, and from video to text respectively, enhances learning outcomes significantly more than preserving the mode. These findings could influence digital instructional methods in a sense that instructional videos and text as means of peer teaching and tutoring might be used more effectively.

Teaching on video as an instructional strategy to prepare open-minded citizenship lessons

Presenting Author:Suzan van Brussel, Avans University of Applied Sciences, Netherlands; **Co-Author:**Miranda Timmermans, Avans university of applied sciences, Netherlands; **Co-Author:**Peter Verkoeijen, Erasmus University Rotterdam, the Netherlands, Netherlands; **Co-Author:**Fred Paas, Department of Psychology and Education and Child Studies, Netherlands

Learning to prepare and teach open-minded lessons is crucial for student teachers because by being open-minded in a citizenship education lesson, pupils are provided with a good example of a deliberation mode. In addition, it creates an atmosphere in which pupils feel free to express their own views and to learn about the views of others. The aim of this experiment was to examine which instructional strategy best supports student teachers' learning to prepare an open-minded citizenship education lesson after an instruction on open-mindedness and how to prepare an open-minded citizenship education lesson. Therefore, learning by teaching on video (TOV) was pitted against preparing to teach (PTT) and restudy (control condition). Based on the generative learning hypothesis and the social presence hypothesis, we expect that participants who teach the learning content on video will design a more open-minded lesson because they have obtained a deeper conceptual understanding of the learning content compared to respectively participants who only prepare a lesson and restudy. Because it is still unclear what the responsible mechanisms are for possible benefits of learning by teaching on video, we also examined conceptual knowledge, feelings of social presence, arousal and open-mindedness levels. The data collection has been completed ($n = 175$), but the analysis has yet to take place: The data analysis plan was pre-registered at the Open Science Framework.

Session N 13

25 August 2021 15:45 - 16:45

Session Room 14

Symposium

Cognitive Science

Integrating evidence to address conflicting claims: Challenges and instructional approaches

Keywords: Cognitive Skills, Design-based Research, Educational Psychology, Inquiry Learning, Literacy, Reasoning, Science Education

Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Clark Chinn, Rutgers University, United States

Discussant: Helge Strømsø, University of Oslo, Norway

The modern world confronts citizens with conflicting claims on numerous issues. One strategy for addressing these conflicts is to deliberate on the evidence that supports various claims. Citizens can endeavor to integrate evidence (Duncan et al., 2018), which can involve combining information from various sources to develop a picture of what the overall evidence says, decide (if possible) which position(s) are best supported by the overall evidence, work out how conflicting evidence might be reconciled, and so on. In evidence integration, relevant evidence can range from empirical studies to information provided by experts and other knowledgeable sources. There is a need for more research that explicates the challenges in integrating evidence and that develops instruction that improves laypeople's ability to integrate evidence. All three papers in this symposium address these gaps by exploring students' strengths and weaknesses in integrating evidence; in addition, two of the papers investigate instruction designed to improve evidence integration. The first paper investigates high school science instruction that fosters more sophisticated abilities to integrate evidence (e.g., valuing triangulated evidence, evidence that is diagnostic for theory judgments, etc.). The second paper shows that undergraduates often prefer single cherry-picked studies to larger bodies of evidence, thus failing to consider the full range of evidence. The third paper demonstrates that a document-mapping intervention with ninth graders can enable evaluation and integration of multiple scientific documents that incorporate evidence. The discussion will address challenges in integrating evidence aptly and instructional approaches that can build students' evidential competence.

Linking disciplinary knowledge and epistemic dimensions in student evidentiary reasoning with CADE

Presenting Author:Ala Samaratungavaran, Purdue University, United States; **Co-Author:**Kari Clase, Purdue University, United States; **Co-Author:**Nancy Pelaez, Purdue University, United States; **Co-Author:**Stephanie Gardner, Purdue University, United States

This paper presents results from a study to support high school students' evidentiary reasoning using the CADE framework. The CADE framework emphasizes the complex and multi-dimensional nature of scientific evidence, and the role of disciplinary knowledge and practices in the construction and evaluation of evidence during scientific inquiry. Two high school biology instructors implemented CADE-based disciplinary evidence scaffolds (DES) to support their students' evidentiary reasoning in a laboratory task. Two comparison instructors implemented the same task using general evidence scaffolds (GES). Both scaffolding conditions supported student gains in evidentiary reasoning quality with DES students showing greater gains than GES students.

Integrating evidence when some evidence is cherry picked: Challenges for undergraduates

Presenting Author:Toshio Mochizuki, Senshu University, Japan; **Co-Author:**Clark Chinn, Rutgers University, United States; **Co-Author:**Etsushi Yamaguchi, Kobe University, Japan

The contemporary digital world is rife with conflicting information and evidence. How can people integrate evidence across these documents to resolve conflicts? One powerful strategy is to integrate across documents to develop a picture of what the overall body of evidence says and whether it supports one position over others. But this is challenging because sources often present cherry-picked evidence that give a misleading picture of what the overall evidence shows. Therefore, we report on two experiments that investigate how laypeople make sense of conflicting evidence in multiple documents when some evidence is cherry picked. Undergraduates read two documents with conflicting positions. Document A included one cherry-picked study in support of the position that rewards improve performance (pro-rewards) while Document B explained that most studies support the position that rewards degrade performance (anti-rewards) and introduced one recent supporting study as representative. We varied how explicit the documents were in revealing that Document A's evidence was cherry picked. In Experiment 1, across four conditions, students gave more weight to cherry-picked, pro-reward evidence over a larger body of evidence. Only in Experiment 2 did students show sensitivity to cherry picking, but this was only when the pro-rewards study (standing alone against a large body of anti-rewards evidence) was a relatively weak study. We conclude that undergraduates show only limited awareness of the weaknesses of cherry-picked data; educators need to design more effective instruction to prepare people to integrate information across documents to better understand how much evidence there is on each side.

Integrating Multiple Scientific Documents Using Document Maps

Presenting Author:Danna Tal-Savir, University of Haifa, Israel; **Co-Author:**Sarit Barzilai, University of Haifa, Israel; **Co-Author:**Fayez Abed, University of Haifa, Faculty of Education, Israel; **Co-Author:**Shiri Mor-Hagani, University of Haifa, Faculty of Education, Israel

Critical evaluation and integration of online scientific reports can help students draw informed conclusions about current scientific issues. However, students might fail to attend to sources, to form intertextual connections, and to weigh claims using reasons and evidence from multiple documents. The purpose of this

study was to explore how students utilize a novel document mapping scaffold to visually evaluate and integrate multiple scientific documents that present conflicting claims and evidence. We also examined if students' document maps were related to their argumentative essays. Forty ninth grade students mapped a set of seven online documents on the topic of bottled mineral water and subsequently wrote essays about the topic. Most students were able to construct a two-sided visual representation of the controversy, to create intertextual claims, to form source-content links, and to appropriately evaluate source trustworthiness. Nonetheless, students constructed relatively few intertextual claims and source-source links. Additionally, only about a third of the students included evidence in their maps. Sources and evidence that appeared in the maps were later used in the essays, and map elaboration predicted integration of contrasting positions in the essays. All in all, the findings indicate that students were able to utilize the document mapping scaffold to construct complex models of multiple scientific documents. The findings also suggest that rich visualizations of multiple scientific documents may benefit subsequent written argumentation. However, students may need additional support in order to construct well-integrated documents models and to aptly evaluate and integrate evidence.

Session N 14

25 August 2021 15:45 - 16:45

Session Room 9

Symposium

Learning and Social Interaction

Relations between child-care quality and toddler's cognitive, self-regulatory and social outcomes.

Keywords: Early Childhood Education, Educational Psychology, In-service Teacher Education, Literacy, Mathematics, Numeracy, Self-regulation, Social Development, Social Interaction, Teacher Professional Development

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Simone Lehrl, University of Bamberg, Germany

Chairperson: Anja Linberg, German Youth Institute, Germany

Organiser: Simone Lehrl, University of Bamberg, Germany

Organiser: Anja Linberg, German Youth Institute, Germany

Discussant: Pamela Sammons, University of Oxford, United Kingdom

How different aspects of teacher-child interactions shape children's development in various developmental domains is the central question of the present symposium. Although it is well documented that quality of teacher-child interactions in preschool classrooms affect children's development from three years onwards, research evidence focusing on toddler classrooms is rare. Thus, this symposium focusses on quality of teacher-child interactions within toddler classrooms in Finland, Portugal, Switzerland, and Germany and its effects on various domains of child development. All papers are using the conceptional framework of the Classroom Assessment Scoring System (CLASS Toddler, LaParo et al., 2012) which makes comparisons across the studies easier and lead to a deeper understanding on how teacher-child interactions affect children's development across different cultural contexts. The first paper explores the extent to which the quality of teacher-child interactions is associated with children's self-regulation skills, with a specific focus on differential effects in Finland and Portugal. The second paper from Switzerland asks whether the quality of teacher-child-interactions improve through participating in a web-mediated training for caregivers, and in turn improve children's socio-emotional skills. The third paper, also an intervention study, investigates how teacher-child-interactions and mathematical outcomes of toddlers in Germany relate. The final contribution using a German sample reports results on the relation between interaction quality and mathematical, literacy and socio-emotional skills with a specific focus on the combined importance of home and child-care environments for predicting children's outcome.

La Paro, Hamre & Pianta (2012). Classroom Assessment Scoring System – Toddler. Baltimore, MA: Paul H. Brookes Publishing Co.

Relationship between CLASS-Toddler and children's self-regulation in Finland and Portugal

Presenting Author:Jenni Salminen, University of Jyväskylä, Finland; **Co-Author:**Carolina Guedes, Faculty of Psychology and Educational Sciences, University of Porto, Portugal, Portugal; **Co-Author:**Joana Cadima, Faculty of Psychology and Educational Sciences, University of Porto, Porto, Portugal, Portugal; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

This study examines the association between teacher-child interaction quality and children's self-regulation in Finnish and Portuguese toddler classrooms. The participants included 230 Finnish and 283 Portuguese toddlers and their teachers ($N = 43$ Finland; $N = 29$ Portugal). The children's behavioral self-regulation (attention, working memory, and inhibition control) was individually tested, and the teachers evaluated the children's self-regulation skills in the classroom. The quality of the teacher-child interactions (i.e., emotional and behavioral support and engaged support for learning) was evaluated using the CLASS-Toddler observation instrument. The analyses were conducted with path models using a complex option. The results for Finland show that the engaged support for learning was positively associated with children's attention and inhibitory control, and emotional and behavioral support was positively associated with children's inhibitory control. For Portugal, engaged support for learning was positively associated with children's attention. The results aid in recognizing the characteristics of teacher support that are beneficial to the development of children's self-regulation skills in two sociocultural contexts, hence being of relevance for teacher in- and preservice training.

Can web-mediated trainings improve teacher-child interactions and toddler's socio-emotional skills?

Presenting Author:Sonja Perren, University of Konstanz, Germany; **Co-Author:**Yvonne Reyhing, Pädagogische Hochschule Thurgau, Switzerland

High-quality caregiver-child interactions contribute to positive child outcomes in early institutional childhood care and education. Studies have shown that web-mediated training can improve the quality of caregiver-child interactions at preschool. The current study investigates the impact of a newly developed training programme for caregivers in toddler groups on observed caregiver-child interactions and children's emotional and behavioural regulation competencies and wellbeing in childcare. We hypothesize that positive changes in caregiver-child interactions are associated with positive changes in children's behaviour and well-being.*Methods.* Participating educators attend a web-mediated training focussing on caregiver-child interactions. The impact of the training was measured using live behavioural observations and online questionnaires completed by participants at two time points (pre- and post-test). A T1, the sample consists of 194 children from 18 childcare groups. Two educators of each group participate in the study. Data collection for T2 will be completed till late spring 2021. The quality of caregiver-child interactions was assessed by trained observers using the CLASS toddler observation tool. Educators completed questionnaires on children's emotional and behavioural regulation and emotional well-being. For T1, the measures showed a good scale reliability: CLASS-Emotional and behavioural support: $\alpha = .852$, CLASS-Engaged support for learning: $\alpha = .853$, emotional and behavioural regulation: $\alpha = .826$ and wellbeing in childcare: $\alpha = .801$. Latent change models will be used to test the hypotheses. We will specifically calculate associations between level and change of caregiver-child interactions on level and change of children's behaviour and well-being.

Relations between quality of teacher-child interaction and toddler's mathematical outcomes.

Presenting Author:Simone Lehrl, University of Bamberg, Germany; **Co-Author:**Anja Linberg, German Youth Institute, Germany; **Co-Author:**Dorothea Dornheim, University of Bamberg, Germany; **Co-Author:**Nadine Besser, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:**Franka Baron, German Youth Institute, Germany; **Co-Author:**Johanna Klemm, Otto-Friedrich-Universität Bamberg, Germany; **Co-Author:**Hans Guenther Rossbach, University of Bamberg, Germany; **Co-Author:**Sabine Weinert, University of Bamberg, Germany

This study examines how quality of teacher-child interaction in German toddler classrooms is associated with toddler's mathematical outcomes. Participants were 320 toddlers with their families, and their teachers ($N = 80$) out of 80 classrooms in Bavaria. The quality of teacher-child interactions was measured by certified observers using the Classroom Assessment Scoring System - Toddler. The children's mathematical outcomes were individually tested. The results will show how engaged support for learning, and emotional and behavioral support as two dimensions of teacher-child-interaction quality are specifically related to

children's mathematical skills. The present study will demonstrate, whether and how mathematical competencies could be fostered early in life by teacher-child-interactions.

Relations between child-care quality and toddler's math, literacy, and socio-emotional skills

Presenting Author:Gerlind Grosse, Early Childhood Education Research, Germany; **Co-Author:**Romy Schönfeld, University of Potsdam, Germany; **Co-Author:**Stefanie Barth, University of Potsdam, Germany; **Co-Author:**Antonia Simon, University of Potsdam, Germany; **Co-Author:**Alexander Soemer, University of Potsdam, Germany

The importance of high quality interactions between professionals and children as a key variable for quality in early child care is well documented. The aim of this study is to investigate the correlation between interaction quality and mathematical, literacy as well as socio-emotional and self-regulatory skills in children between two and three years of age. The multi-perspective approach includes the observation of nine child care groups with the instrument CLASS Toddler, questionnaires for parents and pedagogical staff as well as a test series for mathematical, social emotional and early literacy and language skills of children (n=64). Separate multiple regression analysis for the three domains showed small non-significant correlations between mathematical skills and interaction quality, small significant correlations between children's early literacy outcomes and interaction quality but not for receptive vocabulary nor more advanced literacy competencies. Additionally, significant correlations were found between self-regulatory skills and interaction quality (dimension: emotional behavioral guidance). However, the home learning environment turned out to be essential for mathematical competencies. Also, children's social skills assessed through questionnaires show positive correlation with interaction quality (emotional behavioral guidance), while children's self-regulation assessed through questionnaires show a negative correlation. Overall, the quality of active learning support was consistently low, but satisfactory for social and emotional support. The results once again show the potential importance of good interactions for child development and their capability to contribute to more equity in education and opportunity as an essential goal of early child care.

Session N 15

25 August 2021 15:45 - 16:45

Session Room 4

Symposium

Learning and Instructional Technology

Digital personalized learning: conceptualization, operationalization and impact

Keywords: Collaborative Learning, E-Learning/Online Learning, Educational Technology, Experimental Studies, Game-based Learning, Learning Analytics, Learning Technologies, Student Learning, Technology

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Rani Van Schoors, KU LEUVEN, Belgium

Organiser: Rani Van Schoors, KU LEUVEN, Belgium

Discussant: Natalia Kucirkova, University of Stavanger, Norway

Personalized learning is seen as a key force in impacting educational practice. National governments and proponents expect many benefits from adequate use of digital personalized technology, including a positive impact on (non-)cognitive learning outcomes and efficiency. However, literature on digital personalized learning is sometimes enigmatic and ambiguous.

This symposium brings together three recent studies reflecting on the (1) conceptualization, (2) operationalization and (3) impact of digital personalized learning. Building on theoretical frameworks, the papers outline different types of personalized learning and mechanisms to address the personal characteristics of learners. Paper one presents a conceptual framework based on a systematic review of empirical studies on adaptive tools. Paper two provides a novel approach using multimodal data and machine learning techniques to operationalize and offer a better measurement of regulation and develop adaptive and personalized support for regulation interventions. Paper three contains an empirical study to validate the beneficial impact of adaptive learning technology by analyzing log data from an educational game. The symposium concludes with a discussion and reflection on the contribution for the field and the salience of digital personalized education in the current context of a pandemic-stricken world that demands online learning solutions. The discussant identifies the key educational potential of personalized tools (with a link to her own research on adaptive books) and proposes a few desiderata for the research on personalized learning tools.

State of the art of research on digital personalized learning: a systematic review

Presenting Author:Rani Van Schoors, KU LEUVEN, Belgium; **Co-Author:**Jan Elen, KU Leuven, Belgium; **Co-Author:**Annelies Raes, KU Leuven, Belgium; **Co-Author:**Fien Depaepe, KU Leuven, Belgium

Due to the increasing digitization, interest in digital personalized learning (DPL) continues to grow. Many empirical studies on the effect of adaptive tools have used a wide variety in conceptualizing and operationalizing DPL. This systematic review aims to address the lack of consensus by presenting an analysis of empirical studies on technology for DPL in primary and secondary education. The work is guided by the following questions: (1) How is DPL conceptualized in the research field? (2) What types of tools are used in the studies and how are they implemented? (3) What is the current evidence on the effectiveness of DPL-tools in terms of student outcomes? A Boolean search string was used in the databases Web of Science and ERIC, resulting in a dataset containing 6904 articles. A screening based on specific exclusion criteria yielded 53 articles. Our findings reveal great diversity in the conceptualization of DPL and the used tools. On the basis of these findings, we developed a new conceptual framework. Additionally, the results give insight into the effectiveness of DPL. The review concludes by providing guidelines with respect to future research.

Multimodal deep learning model for operationalizing regulation in collaborative learning

Presenting Author:Andy Nguyen, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland; **Co-Author:**Yansen Wang, Carnegie Mellon University, United States; **Co-Author:**Carolyn Rose, Carnegie Mellon University, United States; **Co-Author:**Jonna Malmberg, University of Oulu, Finland; **Co-Author:**Hanna Jarvenoja, University of Oulu, Finland

Self-regulation is an essential element to learning and lifelong success whereas socially shared regulation greatly influences the success of collaboration and collaborative learning. However, measuring regulation, especially in collaborative learning settings, is complicated as regulation is an internal process and often challenging to capture by humans. Recently, multimodal data learning analytics such as machine learning and physiological sensor technology have offered novel opportunities to better understand the regulatory processes during learning. Nevertheless, the current approaches still require extensive analysis after the learning process to detect the regulatory activities and often lack validity with the data from an authentic learning environment. This study proposes a novel approach using multimodal data and machine learning techniques to offer a better measurement of regulation and develop adaptive support for regulation interventions. Particularly, a predictive model is constructed using multimodal deep learning involving video, audio, and electrodermal activities (EDA) data to automatically detect the types of interactions for regulation in collaborative learning. The model is trained using the actual data collected from a real learning environment and then evaluated with another subset of the dataset. The evaluation of the proposed model provides evidence for the possibility of using multimodal data and advanced technology to capture regulatory events. Further, this capability to detect interactions for regulation would allow for the development of adaptive and personalized support for regulation and hence improve learning.

The effect of adaptivity in digital technologies: modeling learning efficiency using game data

Presenting Author:Stefanie Vanbecelaere, KU Leuven, Belgium; **Co-Author:**Dries Debeir, KU LEUVEN, Belgium; **Co-Author:**Wim Van Den Noortgate, KU LEUVEN, Belgium; **Co-Author:**Bert Reynvoet, KU LEUVEN, Belgium; **Co-Author:**Fien Depaepe, KU Leuven, Belgium

During the last decade, many governments and ed-tech companies have demonstrated an increased interest in technology-mediated personalized learning, which resulted in a variety of often game-like adaptive learning environments. At the same time, however, there has been limited attention for the impact of these personalized learning technologies on children's learning efficiency. Does technology-mediated personalized learning, like popular claims insist, foster

learning in young children? This study attempts to empirically validate the beneficial impact of adaptive learning technology by analyzing log data from the Number Sense Game (NSG), an educational game that trains early numerical skills. In total, 81 children were randomly assigned to use either an adaptive or a non-adaptive NSG in six sessions in a three-week period. Using a longitudinal random item response model children's progress within and across sessions was modeled and compared between the two versions of the game. Regardless of the version of the NSG, children demonstrated progress between sessions. However, in comparison with the non-adaptive NSG, the progress was stronger in the adaptive NSG. In addition, there was also a stronger progress within sessions. These results provide empirical evidence that adaptive learning environments can improve learning efficiency in young children.

Session N 16

25 August 2021 15:45 - 16:45

Session Room 15

Invited Symposium

Cognitive Science, Learning and Social Interaction

EFG: New solutions for educational eye-tracking research

Keywords: Artificial Intelligence, Cooperative/Collaborative Learning, Educational Psychology, Mathematics, Quantitative Methods, Social Aspects of Learning and Teaching, Social Interaction, Teaching/Instruction, Video Analysis

Interest group: SIG 27 - Online Measures of Learning Processes

Chairperson: Markku Hannula, University of Helsinki, Finland

Chairperson: Nora McIntyre, University of Southampton, United Kingdom

Chairperson: Maike Schindler, Universität zu Köln/ University of Cologne, Germany

Organiser: Eeva Haataja, University of Helsinki, Finland

Organiser: Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands

Discussant: Hans Gruber, University of Regensburg, Germany

Eye tracking has been the central method to examine the cognitive processes as they happen. Eye movements reflect the participant attention in the moment even when the person is not conscious about these attentional processes. However, eye movement research in real-world settings and during interpersonal interaction is in its infancy, although rapidly expanding. This symposium consists of three presentations discussing the novel methodological approaches to working with eye-tracking data. One presentation discusses the potential of machine learning and artificial intelligence (AI) for supporting eye-tracking data acquisition and processing. The second presentation portrays a case study using AI to identify naturally emerging areas of interest (AOI) during collaboration in classroom environment. The third presentation is a case study that uses dual eye-tracking for studying multimodal joint attention dynamics when teacher is scaffolding student's problem-solving. Together the presentations show the new perspectives for handling more complex eye-tracking data, which is necessary if we are to study attentional processes of collaboration in ecologically valid environments.

The potential benefits of AI for supporting eye tracking in mathematics education and beyond

Presenting Author: Maike Schindler, Universität zu Köln/ University of Cologne, Germany; **Co-Author:** Achim Lilienthal, Örebro university, Sweden

Eye tracking (ET) is a promising tool for researchers and practitioners in mathematics education. Interest is fuelled by recent technical developments that make ET devices increasingly affordable, user-friendly, and accurate. Not least since computational resources are available at low cost, the use of Artificial Intelligence (AI) has the potential to boost the possibilities for ET in mathematics education substantially. In this contribution, we describe the typical ET data acquisition and processing pipeline and identify where AI-support may improve the means to apply ET technology in research and education practice. We also discuss where and how the three basic types of Machine Learning (ML)—supervised, unsupervised, and reinforcement learning—can be useful in the context of mathematics education and education in general.

Clustering targets of visual attention in a classroom: Combining spatial and temporal dimensions

Presenting Author: Markku Hannula, University of Helsinki, Finland; **Co-Author:** Miika Toivanen, SeeTrue technologies, Finland

This paper is a proof of concept for automatically identifying the naturally emerging areas of interest (AOI) in a ordinary classroom environment. The proposed method utilizes visual markers, attached in the surrounding. The locations for the fixations are computed in relation to the detected markers. We then use unsupervised machine learning (clustering) to recognize significant AOIs, with time as one of the dimensions for data points. In a case study with four collaborating students working with laptops, the method worked well. The method identified 438 gaze clusters (AOIs) for a full lesson and it was possible to recognize the gaze target for 74% of these clusters from the automatically produced heatmaps. These clusters vary on duration from short (< 1 minute) to long (over 40 minutes). There seems to be some individual variation in the distribution of gaze durations and some relation between the gaze targets and the distribution of gaze durations.

Multimodal joint attention to mathematical objects through a dual eye-tracking lens

Presenting Author: Anna Shvarts, Utrecht University, Netherlands; **Co-Author:** Andrey Stepanov, National Research University Higher School of Economics, Russian Federation

While student-teacher multimodal discourse is a popular object of studies in mathematics education, a modality of joint attention is either considered visual or not mentioned. In a case study, we question how a student comes to attend the target for solving mathematical problem relations. The analysis of multimodal joint attention dynamics during scaffolding reveals that two participants coordinate an increasing number of modalities till the student manages to notice the target relations and solve the problem. Further, the number of modalities decreases and the student and tutor can jointly attend to a similar problem's solution based only on verbal exchange. We draw attention to the benefits that dual eye-tracking can provide to the traditional videography in the analysis of multimodal interaction and the benefits of analyzing videos and sounds additionally to eye-movements.

Session O 1

25 August 2021 17:30 - 18:30

Session Room 2

Espresso Paper

Cognitive Science, Motivational, Social and Affective Processes

Student Learning and Self-Regulation

Keywords: Achievement, Cognitive Skills, Educational Psychology, Goal Orientation, Higher Education, Metacognition, Motivation, Self-regulation, Student Learning

Interest group: SIG 08 - Motivation and Emotion, SIG 16 - Metacognition

Chairperson: Gudrun Ziegler, France

The unrecognised potential of potential-based achievement goals

Keywords: Achievement, Goal Orientation, Higher Education, Student Learning

Presenting Author: Dirk Tempelaar, Maastricht University, Netherlands

Growth-oriented achievement goal constructs, as personal best goals (Martin, 2006) and potential-based goals (Elliot, Murayama, Kobeisy, & Lichtenfeld, 2015), have been out for more than a decade, but are largely overlooked. Our contribution intends to demonstrate that goal theorists do themselves short, not adopting potential-based goals in their achievement goal framework. Our contribution consists of eight small studies. The first study analyses the extended

AGQ, based on the 3X2 goal framework (Elliot, Murayama, & Pekrun, 2011) containing task-based, self-based and other-based goals, extended with potential-based goals, applying first and second-order confirmatory factor models. The remaining studies investigate relationships between achievement goals and performance measures as well as learning-related constructs derived from learning dispositions instruments: implicit theories of intelligence and related effort beliefs, the alternative goal instrument by Grant and Dweck (2003), adaptive and maladaptive cognitions and behaviours of Martin's (2007) motivation and engagement wheel and achievement emotions. We find that all goal constructs clearly distinguish, and validate a second-order model based on approach and avoidance second-order factors. Next, we find that potential-based goals fulfil a crucial role in the AGQ goal framework in predicting performance and investigating relationships with antecedents and consequences: implicit theories of intelligence and related effort beliefs, adaptive and maladaptive cognitions and behaviours of the motivation and engagement wheel and achievement emotions. We conclude that it is time to adopt these growth-oriented goals in our measurement instruments for goal frameworks, if necessary, at the cost of other types of intrapersonal goals.

Metacognitively aware students exhibit higher creativity and motivation to learn

Keywords: Metacognition, Motivation, Self-regulation, Student Learning

Presenting Author:Kamila Urban, Institute for Research in Social Communication, Slovak Academy of Sciences, Slovakia; **Co-Author:**Marek Urban, Jan Evangelista Purkyně University, Czech Republic; **Co-Author:**Ondra Pesout, J. E. Purkyne University, Czech Republic; **Co-Author:**Jiří Kombrza, J. E. Purkyne University, Czech Republic

Several theories propose a connection between metacognitive abilities, creativity, and intrinsic motivation towards learning. The aim of the present study was to explore the differences between metacognitively aware and unaware students in their learning motivation and creativity. Three hundred and eighty-one university students completed metacognitive awareness inventory (MAI), academic motivation scale (AMS-C28), and performed four verbal creative tasks (product improvement task, consequences task, unusual uses task, and similarities task). Non-hierarchical clustering identified two specific groups of participants; with higher levels and lower levels of reported metacognitive awareness. Students with higher levels of metacognitive awareness were more intrinsically and extrinsically motivated to learn and exhibited less amotivation. Moreover, the students achieved higher scores in creative thinking tasks. More specific analysis, however, showed that the significant differences were demonstrated only in the similarities task and the product improvement task, but not in the consequences task and the unusual uses task.

Daily fluctuations in motivation – A longitudinal diary study over an entire semester at university

Keywords: Educational Psychology, Higher Education, Motivation, Self-regulation

Presenting Author:Henrik Bellhäuser, Johannes Gutenberg-University Mainz, Germany; **Co-Author:**Björn Mattes, Technical University of Darmstadt, Germany; **Co-Author:**Patrick Liborius, Universität Liechtenstein, Liechtenstein

Intrinsic and extrinsic motivation are related to learning success and academic achievement of university students. Process models of self-regulated learning (SRL) suggest that daily academic motivation is affected by study satisfaction on the previous day. In this study, we conduct a secondary analysis of data by Liborius et al. (2019), in which the study behavior of a total of $N = 105$ students was surveyed daily over 154 days (including both lecture period and non-lecture period). We test a mediation model, assuming that SRL components (planning, self-efficacy, time investment, concentration, effort, and procrastination) increase intrinsic motivation and decrease extrinsic motivation on the next day through their effects on study satisfaction. Results show the proposed mediation effects for all predictors except for planning. The study underlines the importance of investigating SRL and motivation on a daily level. Further, we show that effects can vary between lecture period and non-lecture period.

Effects of strategy support on self-regulated use of retrieval practice in higher education

Keywords: Cognitive Skills, Metacognition, Self-regulation, Student Learning

Presenting Author:Marloes Broeren, Avans Hogeschool / Avans University of Applied Sciences, Netherlands; **Co-Author:**Peter Verkoeijen, Erasmus University Rotterdam, Netherlands; **Co-Author:**Guus Smeets, Erasmus University Rotterdam, Netherlands; **Co-Author:**Arends Lidia, Erasmus University Rotterdam, Netherlands; **Co-Author:**Anita Heijltjes, Avans University of Applied Sciences, Netherlands

Using cognitive learning strategies such as retrieval practice is an important aspect of self-regulated learning (Bjork et al, 2013). Results from a lab-experiment revealed that a strategy intervention increased students' self-regulated use of retrieval practice and subsequent test performance (Ariel & Karpicke, 2017). An adaption in a higher education environment showed a more moderate effect on retrieval practice and no effect on performance (Broeren et al, submitted). The question remains whether an intervention can influence the use of retrieval practice during self-study and what type of support students may need to apply the complex cognitive and metacognitive processes involved. In our experiment, embedded in a first-year higher education vocational program, we compared the effects of two different types of strategy support on the use of retrieval practice during self-study. The RP-condition ($n = 31$) received cognitive strategy instructions; the RP++-condition ($n = 33$) received cognitive strategy instructions and metacognitive feedback support from a tutor; a control condition ($n = 32$) received mock instructions. We predicted that the RP++-condition would use retrieval practice more and would perform better on a delayed practice test than the RP and control condition. We expected a similar pattern for RP and control condition (RP > control). Our main findings showed that a combination of cognitive and metacognitive support led to an increased use of retrieval practice during self-study (RP++ > control). Nevertheless, effects were small, no effects were found on performance and the overall use of retrieval practice during the experiment was (very) limited.

To ask or to answer? The effects of answering self-generated questions on expository text retention

Keywords: Cognitive Skills, Metacognition, Self-regulation, Student Learning

Presenting Author:Felicitas Biwer, Maastricht University, Netherlands; **Co-Author:**Wisnu Wiradhang, Binus University, Institute for Psychology, Indonesia; **Co-Author:**Mirjam oude Egbrink, Maastricht University, Netherlands; **Co-Author:**Anique de Bruin, Maastricht University, Netherlands

Retrieval practice is one of the most effective learning strategies for long-term learning. It creates desirable difficulties by making the learning process more effortful and it slows down immediate performance gains but enhances long-term learning. In higher education, due to a lack of available practice questions, teachers often recommend their students to generate and answer their own questions to prepare effectively for an exam as a form of retrieval practice. However, it is unclear whether this is an effective strategy for long-term learning. In this study, we investigated the effect of generating and subsequently answering self-generated questions on expository text retention compared to answering provided questions and rereading. We found no testing effect: Students in the self-generated or provided questions conditions did not retain more conceptual or factual information compared to those in a rereading condition in a delayed test. However, those who practiced retrieval with provided questions retained more information in the delayed test than those who practiced retrieval with their self-generated questions. They also invested more mental effort in answering the questions. Possible explanations for the lack of retrieval practice benefits are low initial retrieval success, which might be increased by providing feedback after the practice test and equating text exposure time with the rereading condition. For answering self-generated questions being beneficial for long-term learning, question quality and the complexity of learning materials are factors needed to be considered.

Triggering goal orientation influences the testing effect

Keywords: Cognitive Skills, Goal Orientation, Motivation, Student Learning

Presenting Author:Tino Endres, University of Freiburg, Germany; **Co-Author:**Alexander Eitel, University of Giessen, Germany; **Co-Author:**Alexander Renkl, University of Freiburg, Germany

Retrieval practice was evaluated as a general learning strategy in multiple studies in the lab and the classroom. Although there are several meta-analyses in favor of positive effects of retrieval, there are still ongoing debates about boundary conditions of retrieval practice especially in ecologically valid contexts like classrooms. One of those boundary conditions is the goal structure. The activation of either learning orientation or performance orientation should influence how students use retrieval and restudy opportunities. In a 2x2 classroom study ($n=97$) we varied whether we triggered learning or performance goal orientation and if students engaged in restudying or retrieval practice. The high school students first read a scientific history text, which was part of their usual curriculum. Afterward, the teacher either triggered learning or performance orientation. Afterward, learners engaged in either restudy or retrieval practice. After two weeks,

we assessed learning performance. We found that retrieval practice interacted with the students' goal orientation. We found a testing effect in the goal orientation group while there was no significant difference within the learning orientation group. These results show that the differences in students' behavior especially in the restudy conditions in an ecological classroom study can be influenced by triggering goal orientation.

Session O 2

25 August 2021 17:30 - 18:30

Session Room 18

Espresso Paper

Assessment and Evaluation, Developmental Aspects of Instruction, Educational Policy and Systems, Learning and Instructional Technology

Educational Effectiveness and Improvement

Keywords: Attitudes and Beliefs, Competencies, Conceptual Change, Content Analysis, Developmental Processes, E-Learning/Online Learning, Early Childhood Education, Educational Policy, Educational Technology, Instructional Design, Motivation, Motivation and Emotion, Qualitative Methods, Quantitative Methods, School Effectiveness, Secondary Education, Survey Research, Synergies between Learning; Teaching and Research, Teacher Professional Development, Workplace Learning

Interest group: SIG 18 - Educational Effectiveness and Improvement

Chairperson: Sog Yee Mok, University of Zurich, Switzerland

The importance of school improvement capacities for improvement processes based on inspection data

Keywords: Content Analysis, Educational Policy, Qualitative Methods, Secondary Education

Presenting Author:Tanja Rettinger, Johannes Gutenberg University Mainz, Germany

Impulses from school inspections are of great significance for improving school quality. In this regard, existing school improvement capacities (SIC) are crucial for the use of knowledge gained from inspection feedback. However, only few research findings exist on the impact of inspections on school improvement that take existing SIC into account; most of these findings are based on cross-sectional studies. Following up on these desiderata, the paper aims to investigate school improvement processes over a long period of time considering existing (and changing) SIC. Using the longitudinal design, school improvement processes that follow inspection feedback were examined at the level of individual schools at four different points in time: First and second inspection report as well as interviews of school principals, conducted after the second inspection, and school improvement reports, written after the first inspection, were examined for a total of 8 schools taken from a representative sample of schools for general education in the German state of Hamburg using qualitative content analysis. Results point to the long-term nature of school improvement processes that are adjusted over time through recurring inspection impulses. It can be shown that improvement processes are interrelated with the SIC at individual schools, since schools with a high improvement capacity engage in different improvement processes than schools with a lower one. In addition to different ways of evaluating inspection feedback and a changing focus on school-related topics over time, the schools show different patterns of orientation that offer possibilities for adaptive support in school improvement.

Pandemic as a driving force for improvement? An analyses of predictors and perceived effects

Keywords: Developmental Processes, Educational Policy, Survey Research, Synergies between Learning; Teaching and Research

Presenting Author:Katharina Maag Merki, University of Zurich, Switzerland; **Co-Author:**Tobias Feldhoff, Johannes Gutenberg University of Mainz, Germany;

Co-Author:Tanja Rettinger, Johannes Gutenberg University Mainz, Germany; **Co-Author:**Francesca Suter, University of Zurich, Switzerland

The COVID 19-pandemic impacted the core of schooling and teaching. The schools were confronted with big challenges that they had to deal wihtin in short time. The questions arise: How managed schools these challenges, which factors supported the successful dealing with these challenges and which effects are associated with the pandemic? These questions were analysed using data of principals of the trinationale study "S-Clever - School improvement faces new challenges" in 14 German states, in Austria, and in five German-speaking Swiss cantons. The results from the SEM show, the more experienced schools were in pre-pandemic digital learning (DL) and school improvement (SI), the more self-efficient they felt during the pandemic, the better they felt informed by school authorities, the less they experienced challenges during to the pandemic. Further, the perceived benefits of the pandemic are positively influenced by the schools' experiences in SI and DL before the pandemic, mediated by the self-efficacy of the schools and the implemented strategies in schools during the pandemic. The perceived quality of the information and regulations by the school authorities has an indirect effect. The results confirmed the importance of pre-pandemic experiences in SI an DL as well as self-efficacy and support from the authorities to better deal with challenges and to benefit of the pandemic. Despite the great challenge posed by the pandemic, it is a driving force for school improvement, but only under specific conditions.

Children's digital experience: Understanding children's perspectives and agency

Keywords: Attitudes and Beliefs, Early Childhood Education, Educational Policy, Educational Technology

Presenting Author:Janniche Elisabeth Broch Wilhelmsen, Oslo Metropolitan university, Norway

While we can safely say that most children today grow up surrounded by digital technology, it seems like both institutions and parents struggle with finding out how to moderate what kind of technology children should use and how to use it. Furthermore, we have little evidence focusing what children themselves think about digital technology and how they use it. This study focuses on digital technology in family life by giving children a voice and examining their experiences. The study is part of a larger EU Horizon 2020 project and includes 10 children ages 5-6 from the Norwegian data. Data includes focus group and individual interviews. In the study we examine issues such as what kind of digital technology children use, what they like and dislike and how they communicate about it at home (their own agency). The thematic analysis aims to understand what children's experiences and thoughts are about growing up in an increasingly digital society. The data suggests that children often have a good understanding of what digital technology is, but that how it is used and when differs. This research adds to our understanding of digital technology from the perspective of children as part of the family ecosystem and it could have an impact on both family life and educational settings in terms of how we must consider what's important for children growing up in a digital age.

Contextual embeddedness of school leadership strategies during the COVID-19 Pandemic

Keywords: Educational Policy, Motivation, Motivation and Emotion, Teacher Professional Development

Presenting Author:Stefan Brauckmann-Sajkiewicz, Alpen-Adria-University, Institute of instructional and school development, Austria; **Co-Author:**Georg Krammer, University College of Teacher Education Styria, Austria

School leadership action is strongly situation-specific in nature. Findings suggest a flexible use of different leadership styles (Brauckmann & Pashardis 2011, Schwarz & Brauckmann, 2015; Hallinger, 2018). At the same time, scholars increasingly point out that the effectiveness of leadership action can be attributed to the fit of leadership strategies and contextual characteristics. Therefore, the contextual embedding must first be considered in order to determine how and to what extent school leaders can operate or influence the development of a teaching-learning environment in their school under challenging circumstances. Thus, this presentation looks systematically into the relationship of contextual variables and practicing leadership strategies during the COVID-19 Pandemic. Our findings suggest that contextual conditions can partially explain differences in school leadership strategies.

Student Autonomy and Support during transition: Co-creation of transition to Practice Curriculum

Keywords: Competencies, Conceptual Change, Instructional Design, Workplace Learning

Presenting Author:Shireen Suliman, Hamad Medical Corporation, Qatar; **Co-Author:**Karen Könings, Maastricht University, Netherlands; **Co-Author:**Margaret Allen, Hamad Medical Corporation, Qatar; **Co-Author:**Ayad Al-Moslih, Qatar University, Qatar; **Co-Author:**Alison Carr, Qatar University, Qatar; **Co-Author:**Richard Koopmans, University Hospital Maastricht, Netherlands

IntroductionThe complexity of graduating medical students' transition to clinical practice, with new roles and responsibilities is still a challenge in medical education. Medical students, college and clinical faculty provide different perspectives and bringing them together to co-create a transition to practice (TTP) curriculum is expected to provide a holistic approach.MethodsUsing an exploratory qualitative approach, we conducted a co-creation study. We recruited 23

final year students and nine academic faculty at Qatar University College of Medicine alongside nine clinicians and five chief residents from Hamad Medical Corporation. We conducted three co-creation sessions (CCS) with college faculty and five with clinicians. Then based on the generated components, a survey was sent to stakeholders who did not participate in the CCS asking for their opinions. The final two CCS involved the three stakeholders to decide about the final components of the co-created curriculum. Results We identified four themes in template analysis of the CCS transcripts: components that clinical, academic faculty and students valued as important; differences in components between CCS with clinicians and with college faculty; components that faculty and students debated about but reached agreement; and added value of involving non-CCS participants. Nine out of 23 students (39%) and 71 out of 109 faculty (65%) responded. Conclusions Medical students' voices should be considered in the development of curricula particularly during their transition when new roles, responsibilities and expectations are anticipated. Being a shared responsibility, college faculty and clinicians provide different perspectives that adds to the richness of the curriculum.

Dealing with challenges in times of disruptions – resilient types of schools

Keywords: Conceptual Change, E-Learning/Online Learning, Quantitative Methods, School Effectiveness

Presenting Author:Nina Jude, University Heidelberg, Germany; **Co-Author:**Katharina Kriegbaum, Heidelberg University, Germany

The world-wide pandemic hit schools in Germany in the middle of the school year in 2020. Rapid change was introduced into the school system, challenging schools to take actions. Policy measures such as immediate school closure left schools to face huge changes in their established organizational and teaching structures. Resources for digitalized and remote teaching as well as school leadership capabilities were put to a test. While many schools struggled in a jungle of regulations and shared responsibilities, other schools took action. A representative online survey targeting school principals evaluated the situation in schools in Germany at the beginning of the school year 2020/2021. Principals were asked about the challenges they faced in different areas of school development, leadership and organization of instruction. Furthermore, availability of support systems were assessed. Indicators also included measures include of growth mindset on a school level. This paper seeks out to analyze differences between schools in dealing with the challenges during the pandemic. In short: What does a resilient school look like? Which role does a growth mindset on school level play for dealing with change? By using a latent profile analysis, four types of schools could be distinguished. These types differ clearly in their principals' assessment of challenges they are facing regarding instructional settings and school staff. The most resilient school type shows highest values in measures of knowledge sharing, coordination, communication, and satisfaction.

Interestingly, types do not differ significantly in their measures of growth mindset.

Session O 3

25 August 2021 17:30 - 18:30

Session Room 13

Espresso Paper

Instructional Design, Learning and Social Interaction, Motivational, Social and Affective Processes, Teaching and Teacher Education

Writing and Teaching Approaches

Keywords: Argumentation, Competencies, Comprehension of Text and Graphics, Instructional Design, Language (L1/Standard Language), Learning Analytics, Literacy, Motivation, Pre-service Teacher Education, Primary Education, Qualitative Methods, Reading Comprehension, Secondary Education, Social Interaction, Teacher Professional Development, Teaching Approaches, Teaching/Instruction, Writing/Literacy

Interest group: SIG 11 - Teaching and Teacher Education, SIG 12 - Writing

Chairperson: Inmaculada Martínez-García, University of Cadiz, Spain

WRITING TALK: TEACHERS' MANAGEMENT OF DIALOGIC METATALK ABOUT WRITING

Keywords: Language (L1/Standard Language), Teaching Approaches, Teaching/Instruction, Writing/Literacy

Presenting Author:Debra Myhill, University of Exeter, United Kingdom

There exists already a rich body of research on dialogic, exploratory talk which points to its significance in developing and securing student learning. However, few studies have researched the role of dialogic talk in the teaching and learning of writing, and especially how it can support developing writers' metalinguistic understanding of how linguistic choices shape meaning in written texts. This presentation will synthesise findings from two studies, both investigating the development of metalinguistic understanding of writing through functionally-oriented grammar teaching. Specifically, this presentation reports on findings related to teachers' management of dialogic metatalk, a particular form of dialogic talk directed towards the articulation of linguistic choice in written texts. The analysis indicates that teachers use both dialogic and monologic interactions, and their confidence in orchestrating metatalk which focuses on linguistic choice may not yet be secure and argues that it may be more constructive to think less about binaries of monologic and dialogic, and more about *talk repertoires*, which help developing writers to become metalinguistically aware, and increasingly assured in writerly decision-making.

The influence of thinking dispositions on synthesis writing: A randomized control trial

Keywords: Argumentation, Comprehension of Text and Graphics, Motivation, Writing/Literacy

Presenting Author:Christian Tarchi, University of Florence, Italy; **Co-Author:**Ruth Villalon, University of Cantabria, Spain

Thinking dispositions are deeply involved in complex tasks, such as synthesis writing after reading multiple texts. To advance current research on synthesis writing, we investigated the association between learner-level ("personal") and task-level ("situational") thinking dispositions. In the present study we compared the contribution of two thinking dispositions (i.e., need for cognition and actively-openminded thinking) on synthesis writing. We tested 122 undergraduate students (Age = 21.38 ± 5.01 ; 107 females and 15 males). After collecting participants' data on relevant control variables (perceived prior knowledge and prior beliefs) and thinking dispositions, participants were randomly assigned to two conditions. In the control condition they were given two pairs of conflicting texts. In the enhanced condition, texts were manipulated by including inside cues aimed at supporting thinking dispositions. In both conditions, students were asked to write two synthesis essays after having read each pair of sources. Overall, results suggested that thinking dispositions can be both, a learner-level and a task-level variable. However, thinking dispositions do not always follow the rule "the more the better". AOT could be to be detrimental for student's synthesis writing performance.

The effects of a genre-based interconnected reading and writing instruction

Keywords: Instructional Design, Reading Comprehension, Secondary Education, Writing/Literacy

Presenting Author:Moniek Vis, Rijksuniversiteit Groningen, Netherlands; **Co-Author:**Amos van Gelderen, University of Amsterdam / Rotterdam University of Applied Sciences, Netherlands; **Co-Author:**Kees de Groot, University of Groningen, Netherlands; **Co-Author:**Jacqueline van Kruiningen, NHL Stenden University of Applied Sciences / Open University, Netherlands

The skills of reading and writing are highly interconnected (Clark, 1996; Fitzgerald & Shanahan, 2000). Meta-analyses of intervention studies suggest that reading skills benefit from writing instruction and vice versa, and that both reading and writing skills benefit from balancing reading and writing instruction (Graham & Hebert, 2011; Graham et al., 2018a; Graham et al., 2018b). However, there seems to be little research on the effects of interconnected reading and writing instruction (IRWI). We define IRWI as instruction of both skills aiming at elements that connect them from the functional and (socio-)cognitive models of reading and writing, and explicitly addressing relationships between reading and writing. The concept of genre is a core element of IRWI. The aim of our research is to test whether a genre-based interconnected reading and writing instruction improves reading and writing skills. Two genre-based lesson series focusing on news articles and columns respectively were implemented in three Dutch secondary schools (2019-2021). Eight participating teachers were randomly assigned to the two conditions. For both conditions, two distinct genre elements were the focus of instruction. The column and news article group function as each other's control group. All students took the same pre- and posttests. Both groups will be compared using analysis of covariance (ANCOVA) controlling for pretest scores. Posttest scores will serve as dependent variables and condition as independent variable. Students from the column condition are expected to outperform students from the news article condition on reading and writing columns, and vice versa.

EXPLORING TEACHERS' ORCHESTRATION OF METATALK ABOUT WRITTEN TEXT

Keywords: Literacy, Qualitative Methods, Social Interaction, Writing/Literacy

Presenting Author:Ruth Newman, University of Exeter, United Kingdom

This paper reports on the qualitative strand of a Randomised Control Trial (RCT) study which involved the implementation of a pedagogical intervention emphasising the relationship between linguistic choice and effect in written text. The intervention was delivered to all year 6 students (aged 10-11) in 55 English schools. Drawing on observational data of 17 lessons, each taught by a different teacher, the analysis presented here focuses on how metatalk – talk about writing - was utilised by teachers during the intervention to foster metalinguistic discussion about written text. The findings draw particular attention to: the way that metatalk about written text manifests in different forms and for different purposes; the particular complexities of metatalk about written text; and how metatalk about can be orchestrated in a way which supports the cumulative development of metalinguistic understanding about written text. This paper argues that students' learning may hinge particularly on how teachers *orchestrate* metatalk repertoires to make connections between ideas and develop understandings in lessons.

Implementation and review of students' writing strategy awareness in storytelling

Keywords: Language (L1/Standard Language), Learning Analytics, Primary Education, Writing/Literacy

Presenting Author:Christina Knott, University Regensburg, Germany; **Co-Author:**Anita Schilcher, University of Regensburg, Germany; **Co-Author:**Johannes Wild, Universität Regensburg, Germany

The presented project provides insights about effective writing support with specific writing strategies. In the project, so-called text production strategies are introduced as a genre-specific form of writing strategies for narration and storytelling in a training course. Their effect on students' writing competence is explored. In the project, a self-regulated training for storytelling was developed on the basis of a theoretical model of writing competence and the theoretical foundations of narration, and was executed in training groups. The individual training modules were tested for their effectiveness in an intervention study. The aim of the study is, on the one hand, to gain a deep understanding of promotion of writing competence and writing skills using the example of the textual pattern of storytelling, and on the other hand to test how these writing strategies can contribute to the acquisition of skills that they can use to write narratives. The evaluations provide information about how students apply and transfer the strategies in different contexts. Furthermore, we want to find out how they reflect on them and what correlation can be established between strategy awareness and text quality.

Primary school teacher students' self-assessed competence development: baseline of first semesters

Keywords: Competencies, Motivation, Pre-service Teacher Education, Teacher Professional Development

Presenting Author:Julia Klug, PH Salzburg, Austria; **Co-Author:**Andrea Magnus, PH Salzburg, Austria

Teacher students' competences are in the focus of teacher professionalization processes. There is an active discussion about how we can evaluate competence-based higher education. Our project IQM PHS aims at exploring primary school teacher students' competence development, motivation and learning strategies longitudinally in the course of their study program. In the completed first project phase, we defined a competence model and collected data of 124 first semesters via an online competence-screening questionnaire as a baseline. Teacher students start with low competence levels, thus, there is a scope for development. They have a good motivational basis, albeit they could apply learning strategies more often. In the upcoming project phases, we will trace students' competence development in relation to their motivation and learning strategies in order to draw conclusions about how, where and when to improve teacher education programs. Findings as well as the applied methodology can guide us in quality management in teacher education.

Session O 4

25 August 2021 17:30 - 18:30

Session Room 11

Espresso Paper

Assessment and Evaluation, Learning and Special Education

Assessment Methods and Tools

Keywords: Assessment Methods and Tools, Competencies, Early Childhood Education, Game-based Learning, Higher Education, Learning Approaches,

Literacy, Mathematics, Psychometrics, Quantitative Methods, Reading Comprehension, Secondary Education, Self-efficacy, Self-regulation, Student Learning

Interest group: SIG 01 - Assessment and Evaluation, SIG 05 - Learning and Development in Early Childhood, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Moritz Börnert-Ringleb, Leibniz University Hannover, Germany

To Play or not to Play: Assessment of Early Mathematical Competencies via Linear Number Board Games

Keywords: Assessment Methods and Tools, Early Childhood Education, Game-based Learning, Mathematics

Presenting Author:Johanna Skillen, Catholic University Eichstätt-Ingolstadt, Germany; **Co-Author:**Katja Seitz-Stein, Catholic University Eichstätt-Ingolstadt, Germany

This study investigated whether early mathematical competencies can be assessed by a game-based measurement. The attractive setting should allow a valid assessment of prognostic relevant number-magnitude-competencies. At-risk children should be reliably identified. We compared the performance of 128 4-6-year-olds in game-based screenings and standardized measures of mathematical competencies. The results indicate satisfying reliability and validity of the game-based assessment, as well as a good differentiation of low-achieving children. An explorative assessment of children's attitude towards game-based or standardized measures speaks in favour of the game-based setting. The potential of number board games in assessing and fostering early mathematical competencies is discussed.

Disentangling self-assessment: Self-assessor profiles in Secondary Education

Keywords: Assessment Methods and Tools, Secondary Education, Self-efficacy, Self-regulation

Presenting Author:Leire Pinedo, Universidad de Deusto, Spain; **Co-Author:**Javier Fernández, Universidad Autónoma de Madrid, Spain; **Co-Author:**Ernesto Panadero, Universidad Deusto, Spain; **Co-Author:**Iván Sánchez-Iglesias, Universidad Complutense de Madrid, Spain

Evidence has shown the influence of self-assessment on students' academic performance. Previous self-assessment research has focused significantly on students' self-grading and even the existing formative self-assessment research has not explored the processes and concrete actions that the students follow when self-assessing. This study aims to contribute to close this research gap by identifying the self-assessors' profiles analysing the concrete actions that 64 secondary education students performed while self-assessing. Video-data was collected from think-aloud protocols, observations and self-reported instruments. The findings showed four different self-assessment profiles for Spanish and Mathematics subjects: no self-assessment, superficial, intermediate, and advanced profiles. Each profile is described with a pattern of different actions performed by the students.

Disentangling self-assessment: Self-assessor profiles in Higher Education

Keywords: Assessment Methods and Tools, Higher Education, Self-efficacy, Self-regulation

Presenting Author:Leire Pinedo, Universidad de Deusto, Spain; **Co-Author:**Javier Fernández, Universidad Autónoma de Madrid, Spain; **Co-Author:**Ernesto Panadero, Universidad Deusto, Spain; **Co-Author:**Iván Sánchez-Iglesias, Universidad Complutense de Madrid, Spain

This study explored the effects of feedback type, feedback occasion and year level in the self-assessment actions of higher education students. A total of 126 university students participated in this experimental, cross-sectional factor type of feedback (rubric vs. instructor vs. combined) study. Participants, while they were being video-recorded, were asked to self-assess one task two times: (1) after they performed it and (2) after receiving feedback. Data came from the video-recordings –i.e. think-aloud protocols and observations- and self-reported instruments. Four self-assessment profiles based on the actions performed by the

participants were identified, describing how students generate their own self-feedback and the role of the external feedback on their own processing.

Developing a measure on bachelor students' experiences of peer ja self-assessment

Keywords: Assessment Methods and Tools, Higher Education, Learning Approaches, Self-efficacy

Presenting Author:Viivi Virtanen, Häme University of Applied Sciences, Finland; **Co-Author:**Henna Asikainen, University of Helsinki, Finland; **Co-Author:**Liisa Myyry, University of Helsinki, Finland; **Co-Author:**Lauri Partanen, Aalto University, Finland

Developing a measure on bachelor students' experiences of peer ja self-assessment

Lauri Partanen, Henna Asikainen, Viivi Virtanen, Liisa Myyry

Aalto University; University of Helsinki; Häme University of Applied Sciences

Abstract

This study aims to explore students' experiences on peer assessment and self-assessment. To accomplish this we develop a new instrument to examine students' experiences on peer and self-assessment. We further study how these experiences relate to study well-being and other aspects in student learning experiences. Our data consists of 259 chemical engineering students in Finland. In the first year of our study, we explored respondents' experiences of self- and peer-assessment based on open question response data. The responses were categorized and used to develop items measuring experiences of peer and self-assessment in six general categories: 1) learning and reflection, 2) motivation and participation, 3) self-efficacy, 4) exhaustion, 5) cynicism, and 6) self-criticism. The quantitative data obtained from these items in the second year of this study will be analyzed in relation to well-established measures of student learning (self-efficacy, approaches to learning, study-related burnout and self-criticism).

Children as Consumers: Extended Competence Modelling with Process Data from a Virtual Supermarket

Keywords: Assessment Methods and Tools, Competencies, Psychometrics, Quantitative Methods

Presenting Author:Philine Drake, German Institute for International Educational Research (DIPF), Germany; **Co-Author:**Johannes Hartig, German Institute for International Educational Research (DIPF), Germany; **Co-Author:**Gunnar Mau, DHGS Deutsche Hochschule für Gesundheit & Sport, Germany; **Co-Author:**Manuel Froitzheim, Center for Economic Education, University of Siegen, Germany; **Co-Author:**Hanna Schramm-Klein, Faculty of Business Administration, University of Siegen, Germany; **Co-Author:**Michael Schuh, Center for Economic Education, University of Siegen, Germany; **Co-Author:**Theresa Mennekes, Faculty of Business Administration, University of Siegen, Germany

While the measurement and modeling of competencies typically focuses on task outcomes, behavioral differences during task completion are often not considered. With digital technologies, competence assessments can provide process data as additional information about the skills and strategies of test takers. Funded by the German Research Foundation (DFG) we focus on the so-called purchasing competence of children and explore how process and product data can be used in an extended competence modelling. We developed a computer-based measuring instrument that includes not only achievement and personality tests but also a simulated supermarket. A first sample of 136 primary school children was given a shopping list and a maximum budget at their disposal. To conduct a psychometric analysis of the data set, and thus a psychometric evaluation of test functioning, a Rasch partial credit model (Masters, 1982) was chosen. As the simulation requires a high level of interactivity, the granularity of our log files is high enough for investigating the task completion process as well as complex cognitive processes like domain-specific problem solving strategies and self-regulation. Using the finite state machine approach and different psychometric methods, we will present results of our theory-based and exploratory process data analyses. These include identified patterns of behavior, their frequency, and their correlations with the task success and other student variables. Our research demonstrates how process data of an interactive, computer-based task can be used in an extended modelling of competencies and how it enhances the theoretical model and its measurement.

Middle school students' understanding of assignments in a self-directed learning environment

Keywords: Assessment Methods and Tools, Literacy, Reading Comprehension, Student Learning

Presenting Author:Gertraud Benke, Klagenfurt University, Austria; **Co-Author:**Samantha Clay, University College of Teacher Education, Carinthia, Austria

In this paper we present a study on students' understanding of task instructions. This is part of a larger effort to help students become better learners in a self-directed learning environment in a lower-track middle school. Based on classroom observations the research team became interested in students' competence concerning the written work assignments and developed a multiple choice question set to assess students' understanding of instructions. The questions were included in a questionnaire on self-directed learning competences which was administered to an entire middle school (5th – 8th grade, about 270 students). Between 40 and 80% of the students answered the questions correctly (depending on the question), we found no difference for grade level and (for most questions) for language spoken at home, but an advantage for girls.

Session O 5

25 August 2021 17:30 - 18:30

Session Room 4

Espresso Paper

Assessment and Evaluation, Educational Policy and Systems, Learning and Instructional Technology, Learning and Social Interaction

Technology-Enhanced Learning And Instruction

Keywords: Argumentation, Assessment Methods and Tools, Attitudes and Beliefs, Cognitive Development, Cognitive Skills, E-Learning/Online Learning, Early Childhood Education, Educational Technology, Informal Learning, Learning Technologies, Parental Involvement in Learning, Peer Interaction, Qualitative Methods, Quantitative Methods, Technology

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 26 - Argumentation, Dialogue and Reasoning, SIG 27 - Online Measures of Learning Processes

Chairperson: Mayra Mascareño Lara, University of Groningen, Netherlands

If you tell me, I will help you – Family climate and parental support for adolescents' internet use

Keywords: Informal Learning, Parental Involvement in Learning, Quantitative Methods, Technology

Presenting Author:Ricarda Kurock, University of Paderborn, Germany; **Co-Author:**Nicole Gruchel, Universität Paderborn, Germany; **Co-Author:**Sabrina Bonanati, Paderborn University, Germany; **Co-Author:**Heike M. Buhl, Paderborn University, Germany

Family climate is an important predictor for adolescents' learning outcomes and plays an important role in family processes, but only little is known about family climate in the digital home learning environment as an informal place of learning. Research in this context shows, that adolescents of families with parents practicing restrictive mediation are less likely to ask their parents for help. Further, the cohesion and adaptability in the family reflecting family functioning is linked to parental support for adolescents' internet use. In addition to emotional cohesion and adaptability in the family, family climate also includes open communication in the family. Especially when adolescents ask for help, the openness in the family in conversations, like parents and adolescents talking about the internet, could provide crucial information for supporting adolescents in learning with the internet. Therefore, the study investigates associations between family climate (emotional cohesion, adaptability, open communication) and (1) adolescents' help requests. Association between family climate and (2) parental

support are also studied. Furthermore, (3) associations between help requests and parental support are examined. $N=717$ eleven-year-old adolescents and $N=417$ of their parents answered a paper-pencil questionnaire. Structural equation modeling was applied. The results show that family climate could be an important predictor for adolescents' help requests, which is associated with parental support for internet use. The role of family climate for parental support in the internet-context will be discussed.

Home Learning Environment, parental support and different types of students' internet use

Keywords: Informal Learning, Parental Involvement in Learning, Quantitative Methods, Technology

Presenting Author:Nicole Gruchel, Universität Paderborn, Germany; **Co-Author:**Ricarda Kurock, University of Paderborn, Germany; **Co-Author:**Sabrina Bonanati, Paderborn University, Germany; **Co-Author:**Heike M. Buhl, Paderborn University, Germany

Internet use is of enormous significance in the everyday life of adolescents and can be distinguished into different types of use (e.g., entertainment-related, informative or school-related). Also in this context, digital home learning environment as an informal place of learning is of particular importance. While some areas of the digital home learning environment, such as structural features or parental mediation are widely researched, comprehensive results on the influence of parental involvement are still lacking. Therefore, the study investigates the influence of parental role construction, self-efficacy, ICT skills on (1) the parents' and students' reported parental support in information related-internet use of the students and (2) on the types of students' internet use at home (entertainment-related, informative, school-related). $N=717$ eleven-year-old students and $N=417$ of their parents answered a paper-pencil questionnaire. Structural equation modeling was applied to answer the research questions. The results show: (A) the frequency of perceived parental support during information-related internet activities differs between parents and students, (B) motivational factors had a higher influence on parents' reported support, while parental ICT skills are the main factors influencing students' reported perception of parental support and (C) an influence on types of internet use could only be established for parental support, which was perceived by the students. The results show that motivational factors and ICT skills of parents in the digital home learning environment of students mainly influence parental support, whereas actively perceived support by students only influences the information-related use of the students.

Cognitive training in kindergarten and insights into cognitive activities at home

Keywords: Cognitive Skills, Early Childhood Education, Learning Technologies, Parental Involvement in Learning

Presenting Author:Efsun Annac, Ludwig Maximilian University of Munich, Germany; **Co-Author:**Frank Niklas, Department of Psychology, Ludwig Maximilian University of Munich, Germany

The kindergarten years are important for children's learning of academic skills such as literacy or numeracy, but also for the advancement of cognitive skills. Executive functions (EF) are important set of cognitive processes for monitoring and control of behaviors, including working memory, inhibition and cognitive flexibility. These EF components were shown to be predictive of academic achievement before children start school. Therefore, early training of these components potentially offers a new perspective for early educational activities and for later school success. A very important environment to advance academic and cognitive skills is the home learning environment (HLE) where children and their parents can actively interact and learn together. The HLE plays a critical role in young children's learning, however, it has hardly ever been considered in cognitive training research. New technologies are shaping the future of educational tools. In recent years, mobile devices have been commonly used for educational purposes aiming to promote young children's learning. The present intervention offers a tablet-based training approach to improve children's EFs and examine the training gains on near-and far-transfer tasks comparing two different training durations. The intervention offers to understand the effect of potential training gains across training groups with a shorter or a longer duration. In order to understand the HLE and the cognitive activities of young children with their parents, we developed a new survey. This survey is designed to provide insights about the cognitive activities at home, allowing to compare training gains with the measure of cognitive activities at home.

Effects of the family ecosystem on lives of the digital generation: Four European case studies

Keywords: Attitudes and Beliefs, Early Childhood Education, Parental Involvement in Learning, Technology

Presenting Author:Ola Kapella, University of Vienna, Austrian Institute for Family Studies, Austria; **Presenting Author:**Merike Sisask, Tallinn University, Estonia; **Presenting Author:**Maria Roth, Babes-Bolyai University, Romania; **Presenting Author:**Tove Lafton, Oslo Metropolitan University, Norway

Most children in Europe live in media-rich households with access to a variety of digital devices. They can be described as the 'digital generation'. In this paper findings from a large-scale EU project 'DigiGen' aims to highlight significant knowledge about how the digital generation uses and is affected by digital technology in their everyday lives. One important part of children's everyday lives is the family, an ecosystem that is undergoing change due to increased digital technology. Yet, we know too little about digital technology use within the family and its impact on family communication and daily life. This paper takes a closer look at how digital technology impacts the family ecosystem aiming to examine the potential positive and negative impacts on family life and communication. We contribute to a deeper understanding of the challenges, advantages and impacts associated with this technology. The data reported on includes interviews with different family members and focus group interviews with children ages 5-10 in four European countries. The data shows that omnipresence of digital technology shapes the lives of children and affects family dynamics. Even for families affected by socio-economic deprivations digital technologies are part of 'doing family' on a daily basis. 'Doing family' expresses the fact that family life is nothing static but is reproduced by each family member and their mutual interactions. This technology is essential for joint family activities and helps to create a sense of 'we-ness' that in turn supports family cohesion and is one way of 'doing family'.

Remote assessment of cognitive functions in children: a systematic review

Keywords: Assessment Methods and Tools, Cognitive Development, E-Learning/Online Learning, Technology

Presenting Author:Chiara Pecini, University of Florence, Italy; **Co-Author:**Costanza Ruffini, University of Florence, Italy; **Co-Author:**Gabriella Giuliano, University of Florence, Italy; **Co-Author:**Monica Morini, University of Florence, Italy

In comparison to in-person assessment, remote assessment of cognitive development can increase accessibility by families from low socio-economic conditions and it may become mandatory in some emergency circumstances. Although tele-assessment is not a novel practice, so far it has been mainly used with adults and for research or screening purposes. Recently, remote cognitive assessment of children increased but several issues, regarding its feasibility and reliability have emerged. In the present systematic review, 23 studies on remote assessment in children, with typical or atypical development, have been selected and analysed. Most of the research documented the presence of technical difficulties in remote assessment conditions, but suggested absence of differences in performance scores between in-person and remote assessment. Children and families gave positive feedback on the feasibility of tele-evaluation. Directions for future research are discussed.

Analysis of students' interactions during playing and modifying half-baked rhetorical games

Keywords: Argumentation, Educational Technology, Peer Interaction, Qualitative Methods

Presenting Author:Evrykleia Panagiotou, National & Kapodistrian University of Athens, Greece; **Co-Author:**Chronis Kynigos, National & Kapodestrian University of Athens, Greece

The rhetorical aspect of argumentation is the most used and studied argumentation form in pedagogical research despite the absence of interaction with the audience. In an effort to contribute to environments and perspectives- in which students experience and exploit the interlocutors' interaction to collaboratively construct better ideas- we designed two choice-driven simulation games, which provoke students to be critical and constructive simultaneously. Both games simulated an assembly, where students, teachers and Ministry representatives attended to decide whether they approve the proposed excursion plan, made with players' choices. Players had 20 choices, from which they should choose the most persuasive ones, looking after to keep balance in three auditorials' grace. The second game was fully functional but half-baked, embedding logical errors in auditorials' reactions, provoking students to identify and fix them. We conducted a 10-hour study with 8 12th grade students. Students' interactions were constantly recorded and fully transcribed. We adopted two qualitative coding schemes focusing on the identification of dialogical moves and their separation into non-dialectical and dialectical moves and also on the expressive features of dialogue content for the interpersonal goals of speakers. We combined the epistemic and interpersonal features of verbal dialogue content. The preliminary results show that the dialogs of students as players were characterized by a large number of nondialectical moves with collaborative expressive indicators of verbal content, whereas the dialogs of students as players and designers of the half-baked game characterized by a large number of dialectical moves with competitive expressive indicators of verbal content.

Session O 6

25 August 2021 17:30 - 18:30

Session Room 6

Espresso Paper

Higher Education, Lifelong Learning, Teaching and Teacher Education

Teacher Professional Development

Keywords: Assessment Methods and Tools, Collaborative Learning, Competencies, Educational Technology, Higher Education, Lifelong Learning, Meta-analysis, Reflection, Survey Research, Teacher Effectiveness, Teacher Professional Development, Workplace Learning

Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development

Chairperson: Nicola Reimann, Durham University, United Kingdom

Peer observation as a teacher professional development mechanism: Participant teachers' perception

Keywords: Collaborative Learning, Lifelong Learning, Survey Research, Teacher Professional Development

Presenting Author: Ester Miquel, Autonomous University of Barcelona, Spain; **Co-Author:** David Duran Gisbert, Universitat Autònoma de Barcelona, Spain;

Co-Author: Mariona Corcelles, Universitat Ramon Llull, Spain; **Co-Author:** Jesús Ribosa, Universitat Autònoma de Barcelona, Spain

Peer observation (PO) consists of pairs of teachers, with similar degrees of experience, who agree to observe each other focusing on one or different pedagogical aspects from their action in class. Evidence-gathering tools are used to offer constructive mutual feedback afterwards, which enables reflection to set goals for improvement. In Xarxa de Competències Bàsiques (Core Competences Network, in Catalan), promoted by the Catalan Department of Education, an intervention was developed. It consists of pairs of teachers who voluntarily plan the observation, carry it out with the help of an observation grid that they have previously adapted, and finally develop a feedback session for joint reflection based on the evidence to find goals for teaching improvement. The aim of our study is to know the teacher perceptions of the difficulties and benefits of the PO process and the potentiality of the specific procedure. The types of objectives for improvement set by the teachers and the action plan to achieve them are also explored. In this paper, the perceptions from 44 teachers are presented. Perceptions were gathered through an anonymous questionnaire. The participant teachers underline overcoming worries and concerns related to peer observation; they point to the potentiality of the procedure that was carried out, as well as emerging difficulties; more than half of the teachers set personal goals for improvement, which address the observed topic as well as classroom management and methodological aspects; and, finally, they highlight the benefits of peer observation, both at personal and institutional level.

Using videos to promote reflective practice on higher education teaching: a cross-national study

Keywords: Educational Technology, Higher Education, Reflection, Teacher Professional Development

Presenting Author: Anna Serbati, University of Padova, Italy; **Co-Author:** Fulvio Biddau, University of Padua, Italy; **Co-Author:** Fiona Dalziel, University of Padua, Italy; **Co-Author:** Alessio Surian, Università degli Studi di Padova, Italy

In the context of the project which this symposium focuses on, two video-based methods have been developed and used to stimulate reflective practice in teaching: intercultural Teaching Process Recall and intercultural Peer Observation. These methods make use of video-recordings of personal teaching practice and are based on reflection and feedback on classroom events to inquire into and to enhance the teaching approach. Drawing on qualitative data collected with academic participants (N= 37) from different disciplines, seniority level, and universities, this study investigates the type of reflection developed through the identification and analysis of classroom events. We analysed evaluation questionnaires, transcriptions of reflective sessions, and reflective forms, finding that pedagogical strategies and social climate of the classroom represented the majority of selected events. Classroom discussion and active and cooperative learning represented a shared concern and focus for reflection among academics. However, several teachers were mostly focused on aspects of performance and self-management, constraining the selective attention of academics and coinciding with little attention to and inquiry into students' thinking and learning. The study contributes to understanding the mechanisms influencing video-based reflection as a vehicle for professional learning of academic teachers and suggests a plurality of strategies that can be adopted in academic development programmes to orient selective attention and scaffold video-based reflective activities.

Scaffolding collaborative reflection: the role of facilitators

Keywords: Collaborative Learning, Higher Education, Reflection, Teacher Professional Development

Presenting Author: Nicola Reimann, Durham University, United Kingdom; **Presenting Author:** Taha Rajab, Durham University, United Kingdom; **Presenting Author:** Teti Dragas, University of Durham, United Kingdom; **Co-Author:** Julie Rattray, University of Durham, United Kingdom; **Co-Author:** Malcolm Murray, Durham University, United Kingdom

In intercultural Teaching Process Recall (iTPR), academics video their teaching and discuss extracts during a mutually supportive transnational video-conference. This paper examines the role of the facilitator in the iTPR process. Views on the benefits of facilitators' active involvement in collaborative reflection are mixed. On the one hand, empirical research highlights that when left to their own devices, levels of reflection can be low; on the other hand, a case is made for the power of the collective knowledge and expertise of the group which might be hindered by too much external control. However, there is a lack of research on collaborative reflection in higher education as studies tend to focus on novice/trainee schoolteachers. This paper considers the impact of facilitators' interventions on the nature of reflection and the dynamics of the reflective discussions. Transcriptions of four iTPR session recordings, reflective fieldnotes and participants' evaluation forms were analysed. While there was individual variation in approaches, facilitators' contributions had three main functions: coordinating the process, enquiring by questioning the recaller, and contributing to the substantive content of the discussion. Substantive contributions, which gradually increased during the session, included praise for good practice, proposals for alternative teaching strategies, and alternative interpretations and perspectives. The study demonstrates that certain contributions by facilitators have the potential to stimulate higher levels of reflection, but there is also evidence that the facilitator taking a more active role may reduce opportunities for participants to contribute. Practical implications for facilitating reflection are discussed.

Intercultural Reflecting Teams in higher education: a closer look at challenges in teaching

Keywords: Collaborative Learning, Higher Education, Reflection, Teacher Professional Development

Presenting Author: Carmen Heckmann, Goethe University Frankfurt, Germany; **Co-Author:** Sabine Fabriz, Goethe-Universität Frankfurt, Germany; **Co-Author:** Miriam Hansen, Goethe-Universität Frankfurt, Germany; **Co-Author:** Julia Mendzheritskaya, Goethe-Universität Frankfurt, Germany

Within the context of the project this symposium focuses on, we applied three methods aimed at collegial reflection on teaching in an international context. One method, the *intercultural Reflecting Team* (IRT), gives higher education (HE) teachers the opportunity to discuss problems from their teaching with a transnational group of other HE teachers, written up and shared prior to a transnational meeting. In our project, we implemented and evaluated iRT in a bi- and trinational context, using video-technology. We evaluated the method over the course of two years with academics from the UK, Germany, and Italy from a diverse disciplinary background and different status groups (EG = 32; CG = 8). Overall, participants evaluated the experience of participation positive and reported an increase in knowledge about practical solutions for problems in teaching. To analyse the benefit from the discussions more deeply and to gain insight into the problems the participants chose to contribute to the discussion, we categorized the written case-descriptions that were submitted prior to the sessions (N = 26). The basic dimensions of instructional quality (Kunter & Voss, 2013) was found to be crucial in the initiation and maintenance of insightful learning processes: 46.15 % of the cases dealt with problems concerning *learning support*, 38.46 % had *cognitive activation* as main topic for discussion and 15.38 % addressed *classroom management* as a challenge in teaching. Impact and potential of the findings for academic development will be discussed.

Identification of professional development needs of a group of teachers for attaining school goals

Keywords: Assessment Methods and Tools, Competencies, Teacher Effectiveness, Teacher Professional Development

Presenting Author: Dace Namsone, University of Latvia, Latvia; **Co-Author:** Liga Čakāne, University of Latvia, Latvia; **Co-Author:** Anete Butkēviča, University of Latvia, Latvia

This research paper presents methodological steps and tools for how to identify teacher professional development needs in the group level which is needed for

attaining school development goals considering an educational reform introducing teaching of 21st century skills. A theoretical framework developed and validated in previous research is used as a basis for defining teacher competence to teach 21st century skills into performance level descriptors with criteria that are used for identifying professional development needs. Current conceptualization of competence implies that it is a complex interplay of different elements that are assessed within a qualitatively oriented lesson observation study combined with a teacher test and a questionnaire. Following principles of design-based implementation research, the methodology is designed by the authors and validated in a sample of 11 schools where lessons were observed (N=263) and involved teachers (N=188) filled the test and questionnaire. Results present descriptions of the methodology steps and tools and how they can be used to identify teacher competence gap and, accordingly, professional development needs to plan evidence-based professional development solution to overcome the gap. An example is given on how this is done for a teacher group that has similar professional development needs regarding the school's development goal.

University Teachers' Professional Development: A Scoping Review

Keywords: Higher Education, Meta-analysis, Teacher Professional Development, Workplace Learning

Presenting Author: Marilou Bélisle, Université de Sherbrooke, Canada; **Co-Author:** Valérie Jean, Université de Sherbrooke, Canada; **Co-Author:** Sawsen Lakhal, Université de Sherbrooke, Canada; **Co-Author:** Tanya Chichekian, Université de Sherbrooke, Canada; **Co-Author:** Nicolas Fernandez, Université de Montréal, Canada; **Co-Author:** Patrick Lavoie, Université de Montréal, Canada; **Co-Author:** Kathleen Lechasseur, Université Laval, Canada; **Co-Author:** Louise Boyer, Université de Montréal, Canada

This presentation aims to provide a state-of-the-art overview of research on university teachers' professional development. To achieve this, a scoping review was conducted and 72 articles were included. Our main focus was on the definitions given to professional development, the means that support this process, their effects and the main conclusions of those research. The findings suggest that professional development in higher education is an evolving field involving a lack of stability and plural names and definitions. We note that this is a process that can be shaped from the outside or by the individual himself (or a group). Nevertheless, it seems that the imposed modalities constrain action and change. While professional development is frequently associated with a professional learning process, many factors come into play, and important limits arise in determining the effectiveness of a particular modality without considering the whole process, which usually involves other modalities, personal motivations, the context of practices, etc. As many modalities are promoted to support professional development, we find that contexts of practice and innovation in teaching practices can also lead to professional learning. Collaborative approaches, whether implemented formally or informally, are identified as being those with the most transformative power to change practices, and therefore improve student learning, as well as supportive and collaborative professional cultures.

Session O 7

25 August 2021 17:30 - 18:30

Session Room 3

Espresso Paper

Higher Education, Learning and Instructional Technology, Teaching and Teacher Education

Teacher Education

Keywords: Argumentation, Assessment Methods and Tools, Competencies, Content Analysis, Cultural Diversity in School, E-Learning/Online Learning, Mixed-method Research, Peer Interaction, Pre-service Teacher Education, Qualitative Methods, Reflection, Secondary Education, Social Interaction, Teacher Professional Development, Technology, Writing/Literacy

Interest group: SIG 01 - Assessment and Evaluation, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education, SIG 12 - Writing, SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Jule Krüger, Universität Duisburg-Essen, Germany

Using the FA-cycle to Explore Teachers' Formative Assessment Activities

Keywords: Assessment Methods and Tools, Qualitative Methods, Secondary Education, Teacher Professional Development

Presenting Author: Liesbeth Baartman, Utrecht University of Applied Sciences, Netherlands; **Co-Author:** Judith Gulikers, Wageningen University, Netherlands; **Co-Author:** Machiel Bouwmans, Utrecht University of Applied Sciences, Netherlands

Research on formative assessment (FA) shows potential benefits for student learning, but appears not easy to implement in the classroom (Antoniou & James, 2014; Black & Wiliam, 2009). A recent review (Authors, submitted) conceptualized teachers' FA activities in the FA-cycle, in order to shed light on what teachers actually do in the classroom when implementing FA. The current study uses the FA-cycle in an empirical study to explore teachers' FA activities and the problems teachers encounter when trying to implement FA during a professionalization trajectory. Also, we specifically focused on practical subjects in secondary (vocational) education, like agriculture, health care and cooking, which have been scarcely studied before. Data were collected as part of a large FA professionalization project for teachers. Nine vocational subject teachers were interviewed about their FA practices and lesson examples were collected and discussed. Results show vocational subject teachers mainly use informal FA activities, like observations and asking questions during students' practical work. The teachers' FA activities focus on phases 1-2-3 of the FA-cycle, working on clarifying learning goals, gathering information about student learning and analyzing this information. Teachers find it difficult to complete the FA-cycle, because current learning goals do not focus on the longer term and are steered by summative examination requirements. On the other hand, teachers who actively involve students in phases 1-2-3 by discussing success criteria and letting students compare their work to the success criteria, report first positive effects on students feelings of security.

The prominence of loss - physical aspects of teaching online during the Covid-19 pandemic

Keywords: Content Analysis, E-Learning/Online Learning, Pre-service Teacher Education, Social Interaction

Presenting Author: Eva Wennäs Brante, Malmö University, Sweden; **Presenting Author:** Anna-Lena Godhe, Malmö University, Sweden

Based on interviews with teacher educators in Sweden, this study explores the challenges faced by teacher educators when having to swiftly transform to online teaching and how this affected their teaching practices. Through a thematic content analysis of the interview data, three themes were found; communicating and teaching, seeing and being, and becoming a teacher. The move online affects teaching and requires greater explicit teaching of central aspects while reducing interaction. The lack of eye-contact and restrictions in body language restrains teaching and makes it harder for the teacher educators to notice when students need support and provide in-time feedback. A greater focus is put on the teacher due to the gaze of the camera and the expectation on teachers to be visible and supportive at all times. Teacher educators act as role models for their students and there is concern that the online environment is too restricted to adequately convey what it means to be a teacher. While the swift move to online teaching has had a positive effect in forcing teachers to cross technological barriers, the loss of physical aspects of teachers and students bodies have had negative effects on qualitative aspects of teaching. More time and opportunities to plan for teaching suitable for online environments is needed to raise the quality of teaching. Since teaching can be considered a relational practice, serious considerations need to be given to how to design online practices to be suitable for teacher education.

Facilitation of Peer Feedback with Video Annotation in Teacher Education

Keywords: Assessment Methods and Tools, Peer Interaction, Pre-service Teacher Education, Reflection

Presenting Author: Ilka Nagel, Østfold University College / University of Oslo, Norway; **Co-Author:** Irina Engeness, Østfold University College, Norway

This study examines the types of feedback first-year student teachers provide with the video annotation tool Studio for their peers' filmed oral presentations and provides insight into how the tool affected the process of providing feedback. Data consists of the (a) written feedback students provided with the video annotation tool, (b) students' responses to the survey and (c) two semi-structured focus group interviews. Qualitative methods were applied to analyze the data. The findings reveal that more than half of all comments were *affirmative* (praise), and only a few offered *advice for further improvement*. The types of feedback the students provided mostly addressed the ways of *communicating* and the *content* of the students' presentations. The students found the feedback concise; however, they expressed concerns about providing feedback to their peers. They indicated that Studio allowed to attach feedback to the concrete moment in the

presentation, and they concluded that providing feedback on their peers' filmed oral presentations enhanced their reflections. The students expressed a positive attitude about the learning design and described it as useful, contributing to their learning and relevant for their future teacher profession. These findings emphasize the importance of teacher educators' awareness of the potential, benefits and limitations of the video annotation tool Studio to enhance pedagogy and students' reflections on their teaching practices. The findings also indicate the importance of students' awareness of the assessment for learning approach to improve the quality of their feedback.

Using Visual Thinking Strategies for stimulating intercultural sensitivity in pre-service teachers

Keywords: Cultural Diversity in School, Mixed-method Research, Pre-service Teacher Education, Reflection

Presenting Author:Marjolein Deunk, University of Groningen, Netherlands; **Co-Author:**Hanke Korpershoek, University of Groningen, Netherlands; **Co-Author:**Mariëtte Hingstman, Rijksuniversiteit Groningen, Dept of Education and GION, Netherlands; **Co-Author:**Annegien Langeloo, Alfa College, Netherlands

Many teachers struggle with how to deal with the increasing ethnic-culturally diversity in classrooms and provide all students with equal learning opportunities. Pre-service teaching programmes therefore aim to better equip their students, offering learning content and (self-)reflective activities on the topic. The current study investigates how reflecting on multiculturally themed pieces of art, using the innovative method *Visual Thinking Strategies* (VTS; Hailey, Miller & Yenawine, 2015), can be used for stimulating intercultural sensitivity of students. Participants are 49 students in year 2 of a pre-service teacher primary education programme of the university of Groningen, the Netherlands. Content analyses of student reflections during two small group VTS-sessions are combined with pre- and posttest questionnaire data on professional and personal intercultural sensitivity (Bennet, 1986; Chen, 1997). Results show that Visual Thinking Strategies can be a good method for eliciting critical self-reflection on topics related to ethnic-cultural diversity and inclusion. Questionnaire data showed that students' intercultural sensitivity was relatively high before and after the VTS-sessions, although social desirability may have played a role. No clear connections between individual contributions during VTS-sessions and level and growth of intercultural sensitivity was found. A follow-up activity is recommended, in which students further explore the groups' contributions during the VTS-sessions, explicate their own frame of reference and implicit associations, and in which a connection is made with theoretical concepts. In combination this could serve as a basis for better understanding educational theory on diversity and inclusion and its implications for practice.

Contrasting two brief online interventions to write better argumentative synthesis at university

Keywords: Argumentation, E-Learning/Online Learning, Pre-service Teacher Education, Writing/Literacy

Presenting Author:Ruth Villalon, University of Cantabria, Spain; **Co-Author:**Maria Luna, Universidad a Distancia de Madrid (UDIMA), Spain; **Co-Author:**Isabel Martínez-Álvarez, Madrid Open University (UDIMA), Spain; **Co-Author:**Mar Mateos, Universidad Autónoma de Madrid, Spain

Writing an argumentative synthesis is a common but demanding task, so usually undergraduates require more instruction to improve their synthesis skills. The objective of this study was to compare two instructional assistances supported by Moodle platform, one already tested (Luna et al., 2020) and the other one considered only in this work, focused on the reading and writing processes of written argumentation. Sixty-six undergraduate students volunteered to participate. As an academic task, they were asked to write a synthesis after reading two sources which presented contradictory positions about an educational issue as a pre-test, read two new texts about a different but equivalent issue and write a new synthesis following one of two types of instructional virtual environments. Both trainings presented similar tools, employing videos, graphic organizers and exercises, but the first condition (N=33) focused more on linguistic features while the process intervention included a modelling video and a script with questions to guide the reading and writing processes (N=33). In this paper we also analyse how students used the guide. Results show that synthesis of both conditions were similar in the pre-test but, after the intervention, the level of integration of the written products were higher in both conditions, but more in the process intervention. Nonetheless, the products that achieved medium and maximum integration were still limited. In addition, the case analysis points to different ways of approaching the guide, which are partially related to the quality of the written synthesis. Educational implication and further research will be discussed.

Key elements of critical digital literacies from the perspective of school education

Keywords: Competencies, Qualitative Methods, Teacher Professional Development, Technology

Presenting Author:Minna Lakkala, University of Helsinki, Finland; **Co-Author:**Liisa Ilomäki, University of Helsinki, Finland; **Co-Author:**Veera Kallunki, University of Helsinki, Finland; **Co-Author:**Anastasia Gouseti, University of Hull, United Kingdom; **Co-Author:**Darren Mundy, University of Hull, United Kingdom; **Co-Author:**Juliana Raffaghelli, Universitat Oberta de Catalunya, Spain; **Co-Author:**Marc Romero, Universitat Oberta de Catalunya, Spain; **Co-Author:**Teresa Romeu, Universitat Oberta de Catalunya, Spain; **Co-Author:**Maria Ranieri, University of Florence, Italy; **Co-Author:**Isabella Bruni, University of Florence, Italy; **Co-Author:**Alice Roffi, University of Florence, Italy

Increased access to digital technologies and social media has created new opportunities and challenges for education. Digital tools are used by schools to support teaching, learning and interaction, enhance professional development and more recently to facilitate emergency remote education. These digital practices, however, also challenge existing pedagogical models and raise questions in relation to teachers' critical digital literacies. Furthermore, teachers play a key role in ensuring that the younger generations acquire knowledge and skills relevant for taking a critical disposition towards various phenomena and practices in the digitalised world. Against this context, this paper presents the findings of a qualitative study that intended to develop an understanding of teachers' perceptions, experiences and needs in relation to critical digital literacies. The empirical findings were used to inform and finalise the design of a new Critical Digital Literacy (CDL) framework for primary and secondary teachers and schools across Europe. According to the interview analysis, the CDL framework captured all relevant aspects of critical digital literacies in the school context. While different sub-dimensions of CDL were reported to be more prevalent for each national group, the framework facilitated focusing on specific transversal issues which require attention across European schools. Additionally, the findings are particularly relevant in light of the Covid-19 related school closures and the move to online learning since the teachers acknowledged in the interviews how enhancing their own and their students' critical digital literacies appeared to be more important than ever before.

Session O 8

25 August 2021 17:30 - 18:30

Session Room 16

Espresso Paper

Higher Education, Teaching and Teacher Education

Teacher Professional Development

Keywords: Case Studies, Early Childhood Education, Educational Technology, Emotion and Affect, Higher Education, Learning Technologies, Mathematics, Mixed-method Research, Self-efficacy, Social Aspects of Learning and Teaching, Social Interaction, Teacher Professional Development, Teaching Approaches, Teaching/Instruction

Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development

Chairperson: Emer Ring, Ireland

New teachers' professional development needs in response to emergency remote teaching in Scotland

Keywords: Learning Technologies, Mixed-method Research, Self-efficacy, Teacher Professional Development

Presenting Author:Rachel Shanks, University of Aberdeen, United Kingdom; **Presenting Author:**Mark Carver, University of Strathclyde, United Kingdom

As teachers in Scotland were challenged to respond rapidly to changes in teaching during national COVID-19 lockdowns of 2020 and 2021, this study investigated the responses of teachers who were surveyed about how well they felt able to meet these challenges and how this compared with more general abilities, such as providing pastoral support or using information technology. Results indicated that new teachers felt very able to cope with these demands, going against much of the emerging research at the time from other countries which suggested that teachers were struggling, particularly with the challenges of teaching online. Further statistical analysis and three focus groups suggested that understanding teachers' responses needs to move beyond their ability to teach online or use online tools, drawing on a broader concept of teacher reflexivity. It is argued that this makes a theoretical and methodological contribution to

existing surveys of teacher efficacy based on the OECD's TALIS, and the study's results for Scotland indicate that existing provision for initial teacher education does not require substantial modification to meet new demands for teaching and learning in uncertain times.

Building blocks for higher education teachers' professional development aimed at innovation with IT

Keywords: Educational Technology, Higher Education, Learning Technologies, Teacher Professional Development

Presenting Author:Marlies ter Beek, University of Twente, Netherlands; **Presenting Author:**Kim Schildkamp, University of Twente, Netherlands; **Co-Author:**Dorien Hopster-den Otter, University of Twente, Netherlands; **Co-Author:**Dana Uerz, HAN University of Applied Sciences (UAS), Netherlands; **Co-Author:**Anne Horvers, Radboud University Nijmegen, Netherlands

Educational innovation with technology offers many opportunities for higher education, but also requires new knowledge, skills, and attitudes from teachers. The shift to online education during the COVID-19 pandemic has made the need for teachers' professional development even more apparent. Teachers play a crucial role in realizing educational innovation with IT, and therefore, effective professional development for teachers is essential. This paper presents a literature review in which effective elements – building blocks – are identified for effective professional development (PD) of teachers in higher education aimed at educational innovation with IT. These building blocks are categorized into three domains: 1) characteristics of the PD itself, 2) teacher characteristics, and 3) organizational characteristics. The model enables educational designers, management, and individual teachers to make conscious and substantiated choices with regard to the design, improvement, and/or support of teachers' PD.

An integral approach towards professional development aimed at educational innovation with IT

Keywords: Educational Technology, Higher Education, Learning Technologies, Teacher Professional Development

Presenting Author:Marlies ter Beek, University of Twente, Netherlands; **Presenting Author:**Marieke van Geel, University of Twente, Netherlands; **Co-Author:**Dorien Hopster-den Otter, University of Twente, Netherlands

The COVID-19 pandemic shows the necessity for educational innovation with technology. Higher education institutions have taken major (compulsory) steps within a short period of time. However, it still seems difficult to implement technology innovation in such a way that it is preserved in the long-term curriculum. Lecturers are often expected to innovate themselves, but they do not operate individually. Each lecturer is part of a team, a study program, a faculty, an academy, and an institution. Moreover, lecturers require new knowledge and skills to innovate their education with technology. Stakeholders from different departments within the educational environment should work together to support and enable lecturers in designing innovative education. To do so, it is important that various stakeholders jointly discuss the innovative use of technology within the institution and periodically reflect on this theme. This study presents the development and validation of the 'integral IT motion sensor': an instrument to create awareness and action regarding educational innovation with technology. The instrument offers board members, managers, HR, IT-support staff, students, and lecturers a guide to discuss and reflect on substantive themes such as vision and policy, leadership, opportunities for professionalization, and the technological infrastructure within the organization. This paper describes the development of the instrument as well as the validation by educational experts and end-users in higher education.

'SustainableFood', a school-NGO collaboration towards more sustainable food consumption

Keywords: Case Studies, Social Interaction, Teacher Professional Development, Teaching/Instruction

Presenting Author:Margret Sævarsdottr, University of Oslo, Faculty of Education, Norway; **Co-Author:**Marit Hovland, Department of Education, University of Oslo, Norway; **Co-Author:**Ole Smørdal, Department of Education, Norway

Food and health education is a compulsory ninth-grade subject in Norway, in which students will learn about practical cooking and to reflect critically on food- and health-related issues. 'SustainableFood' is an alternative lesson plan developed by an NGO in Norway, with a stronger focus on sustainable development (ESD), e.g., on food waste as a contributor to climate change and on alternatives for food consumption that may contribute to a green shift. 'SustainableFood' has run for three years, in 30 school classes, in collaboration with ten municipalities in Norway. ESD has traditionally depended on engaged teachers and on interest and support among school owners and school management. This paper is based on an empirical study in one school as an example of the mentioned alternative lesson plan, in which the NGO introduced 'SustainableFood' to a group of teachers, along with a theoretical lesson by the NGO and practical cooking based on newly acquired skills in critically judging leftover food and reducing food waste. We present findings that indicate that students developed action competence to reduce food waste by only a small extent, and we discuss challenges identified in relation to a collaboration between an external actor and a school, and how teachers struggled to translate the NGO lesson plan into their own teaching practices.

Residual impacts of professional development: A cross case analysis

Keywords: Mathematics, Teacher Professional Development, Teaching Approaches, Teaching/Instruction

Presenting Author:Karen Koellner, Arizona State University, United States; **Co-Author:**Nanette Seago, WestEd, United States; **Co-Author:**Nicora Placa, Hunter College, City University of New York, United States

Mathematics professional development has been prevalent worldwide as we persist to create better mathematics instruction and access to children. This study used a mixed method approach – an analysis of survey data and cross case analysis – to investigate the residual impacts related to content, pedagogy and resources that teachers took up five years after participating in one of four funded professional developments. Survey analysis indicates that there are differences related to uptake in context and structure of professional development. Cross case analyses further support the more nuanced affordances and constraints of design features as well as individual teacher's efficacy, expectations, and needs.

Personal and professional contribution of SEL continuing education program to preschool teachers

Keywords: Early Childhood Education, Emotion and Affect, Social Aspects of Learning and Teaching, Teacher Professional Development

Presenting Author:Yael Kesner Baruch, Beit Berl College, Kfar Saba, & Levinsky College of Education, Tel Aviv, Israel, Israel

Social and emotional learning (SEL) refers to a broad range of competencies which correspond to elements of social, emotional, and behavioral skills. Today, an extensive array of comprehensive SEL curricula is offered to educators to support their practices for nurturing K-12 learner's social and emotional competencies. However, as warm and supportive teacher-child relationships are mainly derived from teachers' own social-emotional competence and well-being, a question exists concerning how these curricula effect the teachers personally. In early childhood, SEL is crucial as it is central to both concurrent and later children's development and abilities. As young children spend a large amount of time in preschool settings, preschool teachers serve as prominent caregivers to them and play an essential part in creating a positive climate in the classroom in which SEL can prosper. In Israel, several SEL curricula is offered to preschool teachers to support their practices for nurturing SEL however, their evidence-based practices are scarce. This study investigates the contribution of a specific SEL preschool continuing education program (*'Hacoach Lifroach'*) to teachers' personal and professional social-emotional competence. Qualitative research tools were used with 18 preschool teachers who enrolled in this preschool continuing education program. Results indicate that following enrollment, teachers' felt their personal and professional social-emotional competence were improved and interrelated. In addition, both play an essential part in creating a positive climate in classroom. These findings highlight the importance of placing teachers' personal social-emotional competence and well-being at the center of professional development and achievement.

Session O 9

25 August 2021 17:30 - 18:30

Session Room 1

Espresso Paper

Educational Policy and Systems, Higher Education

Ethnography

Keywords: Case Studies, Collaborative Learning, Culture, Design-based Research, Educational Technology, Ethnography, Learning Approaches, Qualitative Methods, Social Development, Social Interaction, Social Sciences

Interest group: SIG 04 - Higher Education
Chairperson: Julia Morinaj, University of Bern, Switzerland

Recurring Challenge under New Sign: Autonomy in Student Crowd Research Projects

Keywords: Collaborative Learning, Design-based Research, Educational Technology, Ethnography

Presenting Author: Alexa K. Bräse, University of Hamburg, Germany; **Co-Author:** Nele K. Groß, University of Hamburg, Germany; **Co-Author:** Gabi Reinmann, Universität Hamburg, Germany

Autonomy in planning and action is an integral part of education for sustainable development and citizenship education. While it is clearly set as an objective, its value and implementation as a means for learning is a topic of discussion and context-sensitive instructional design. In research-based learning (RBL) in higher education, several models address the learners' autonomy. In our contribution, we aim to add to the discourse on autonomy in RBL by presenting and discussing an observational study on student crowd research, which is part of a design-based research project. In student crowd research, many students with different local and disciplinary backgrounds can participate in research projects on sustainable development, organized, guided and documented within an online learning environment. There is a planned autonomy manifested in instructional and support material, but it is an open question whether this results in the perception and use of autonomy. We therefore focus our research on the question how students cope with the given scope for action within crowd research projects.

Towards a transformative stance in research on learning and education: theoretical challenges

Keywords: Ethnography, Qualitative Methods, Social Development, Social Sciences

Presenting Author: Alfredo Jornet, University of Oslo, Department of Teacher Education and School Research, Spain; **Presenting Author:** Giulia Messina Dahlberg, University of Gothenburg, Sweden; **Presenting Author:** Antti Rajala, University of Oulu, Finland; **Presenting Author:** Alessio Surian, Università degli Studi di Padova, Italy; **Co-Author:** Peter David Renshaw, The University of Queensland, Australia

The ongoing ecological, political and economic crises challenge research on learning and education to move beyond neutral and pragmatic orientations to theorise the political contexts and consequences of our scholarship. Persistent inequity and racism in modern societies as well as the imminent environmental catastrophe call into question research frameworks concerned with adaptation to given societal demands, such as researching and designing efficient means of preparing learners for existing labour markets. As researchers of learning we need to question the purposes of our research, whose needs it serves, and with whom we collaborate. There is a need for a transformative research agenda, set at the core of education and educational research, that challenges the existing societal practices and structures that are otherwise accepted and taken for granted.

However, when framing research as a transformational pursuit of possible futures, we can no longer ignore the kinds of responsibilities that we must grapple with and commit to in our scholarly work; not least when dealing with contested social and ecological issues. Moving beyond statements arguing for the need of transformative methodologies, our goal in this paper is to discuss concrete theoretical challenges that researchers need to face to overcome uncritical ways of doing research on learning and education. We claim that researchers' political subjectivities are central as active participants in envisaging and researching better futures. The challenges and dilemmas of such an activist research stance will be considered in concrete examples of empirical research carried out by the authors in different countries.

The politics of expansive learning in three social movements

Keywords: Ethnography, Learning Approaches, Social Development, Social Interaction

Presenting Author: Yrjö Engeström, University of Helsinki, Finland; **Co-Author:** Mikael Brunila, McGill University, Montreal, Canada; **Co-Author:** Juhana Rantavuori, Center for Research on Activity, Development and Learning CRADLE, Finland

For social movements, a critical issue is their sustainability over longer periods of time. Durable movements are rare. Learning is a key factor behind durability. A movement needs to establish mechanisms of learning that allow it to renew, develop and transform its practices. Scholars have recently turned to expansive learning as a longitudinal and generative mode of learning that might be adequate for supporting resilience and sustainability in social movements. Systematic fostering of expansive learning involves deliberate political choices and actions – a politics of expansive learning. We will examine elements of such politics in three social movements, namely La PAH in Barcelona, Spain; NYCCLI in New York City; and the Herttoniemi Food Cooperative in Helsinki, Finland. Expansive learning is learning in activity. A critical question is: How is expansive learning embedded in, or woven into, the activity system(s) of the given social movement? In the analysis of each of the three cases, we identify expansive learning actions and examine to what extent they form expansive learning cycles. The scale and scope of the focal learning process were different in each case. The deliberate fostering of expansive learning in social movements entails strategic choices related to the way learning is embedded in the activity system(s) of the movement: who are the key learners and how are their learning actions distributed and punctuated in time and space.

Talking with, talking back. On rules and transgressions in researching diversity and communication

Keywords: Culture, Ethnography, Qualitative Methods, Social Sciences

Presenting Author: Sangeeta Bagga-Gupta, Jönköping University, Sweden

Taking the problem of fragmentation of knowledge within contemporary hegemonic knowledge regimes as a point of departure, this paper offers an undisciplinary mobile gaze and makes visible the workings of naming people and naming language in Swedish educational spaces. It talks with mainstream notions regarding human diversity and communication by aligning with scholarship that talks back by troubling naturalizations regarding knowing and learning generally, and what it means to be human more specifically. The aim of the paper is to highlight the need to interrogate how educational research itself perpetuates a hegemonic recycling of problematic and reductionist concepts vis-à-vis human diversity and communication. This talking with and talking back constitutes a delicate balancing act wherein engagement with alternative global epistemologies, rather than global-North naturalized points of departure are critical. Drawing traction from ongoing discussions on decolonizing scholarship, this paper talks with the ways in which taken-for-grantedness regarding a "linguistic order of things" shapes education and thereby troubles the status quo. It explicitly draws attention to a Second Wave of Southern Perspectives (SWaSP) framing whose tenets build on two theoretical clusters of relevance to issues of human diversity and communication, including the complicity of scholarship in making visible/invisible multiple knowledges regarding the same. The paper argues for going beyond programmatic theoretical and methodological stances and juxtaposes three telling examples from across time to illustrate its agenda. By taking an undisciplinary stance, mainstream epistemological rules can be recognized as timespace creations that can be transgressed in the knowledge production enterprise.

Digital Civic Participation Youth Cultures in Estonia, Greece and the UK

Keywords: Case Studies, Culture, Ethnography, Social Sciences

Presenting Author: Athina Karatzogianni, University of Leicester, United Kingdom; **Presenting Author:** Katrin Tiidenberg, Tallinn University, Estonia; **Co-Author:** Dimitris Parsanoglou, Panteion University of Social and Political Sciences, Greece

This research is part of the Horizon 2020 project 'DigiGen' in which three teams from Estonia, Greece and the United Kingdom are researching 'ICT and transformations of civic participation', focusing on adolescents between the ages of 16-18 years of age. We investigate the context within which the political behaviour of young people is manifested online and assess the extent to which it affects offline political practices. Within the evolving ecosystem in these three sociopolitical/national contexts this comparative study, defines political engagement broadly as encompassing both grassroots mobilization, activism and participation in institutional politics as well as new participatory repertoires. We employ a triangulated methodology, using the following research techniques: netnography, digital storytelling workshops, and multimodal critical discourse analysis. We have also identified four areas of interest: digital citizenship (e.g. access, commerce, communication, literacy, etiquette, rights and responsibilities, health and well-being, security/safety, data justice, digital inequalities). Second, digital media use by adolescents (and specific problems relating to adolescence). Third, digital activism scholarship (with specific focus on youth participation in social movements, everyday activism, new participatory repertoires, and leadership emergence theories in social movements). Fourth, youth political culture and digital activism/citizenship specific to each country and the identification of cross-cultural continuities and discontinuities that may emerge in comparison. This paper reports on data from the first phase of the project focusing on results from the netnography data in each of the three countries.

Session O 10

25 August 2021 17:30 - 18:30

Session Room 7

Espresso Paper

Culture, Morality, Religion and Education, Higher Education, Learning and Instructional Technology, Lifelong Learning

Methods in Learning Research

Keywords: At-risk Students, Attitudes and Beliefs, E-Learning/Online Learning, Higher Education, Language (Foreign and Second), Lifelong Learning, Mixed-method Research, Motivation and Emotion, Qualitative Methods, Quantitative Methods, Self-efficacy, Social Aspects of Learning and Teaching, Social Sciences, Student Learning, Survey Research, Teaching Approaches, Teaching/Instruction

Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education, SIG 17 - Methods in Learning Research

Chairperson: Martin Merkt, Germany

Development and validation of an instrument for measuring mentoring in higher education

Keywords: Higher Education, Quantitative Methods, Survey Research, Teaching Approaches

Presenting Author: Wendy Nuis, Maastricht University, Netherlands; **Co-Author:** Simon Beausaert, Maastricht University, Netherlands

Higher education has been increasingly focussing on personalized learning and competence-based education. To support these institutional goals, mentoring programs have become an integral part of many educational curricula. Current empirical research shows positive effects on a variety of outcomes such as retention rates, knowledge acquisition, motivation, or academic persistence. However, most empirical studies are subject to one or more methodological issues. First, quantitative studies often lack or use vague operationalizations of the mentoring concept. Second, most measurement instruments used to evaluate mentoring are not theory-driven or fail to test and/or report reliability and validity indices. Therefore, this study aimed at developing and validating a theoretically sound instrument to measure mentoring in higher education. The current questionnaire was developed based on a recent literature review which defined and conceptualized mentoring. These findings informed our theoretical framework, which refers to five support types that formed the basis of a newly developed item pool. The final questionnaire consisted of 35 items and five subscales. First, an EFA was conducted on data that was collected at two higher education institutes in June 2020 ($n=200$). Second, a CFA will be conducted on additional data of these schools to be collected in June 2021 (expected $n\geq 200$). Third, a cross-validation will be performed with data collected at a third school in June 2021 (expected $n\geq 85$). The final results will be presented at the EARLI 2021 conference. This study hopes to establish a theory-driven, valid instrument that can support higher education practitioners to evaluate their mentoring program.

Mindful methods: An empirical study of mixed-methods research designs in education research

Keywords: Mixed-method Research, Qualitative Methods, Quantitative Methods, Social Sciences

Presenting Author: Dominik E. Froehlich, University of Vienna, Austria; **Co-Author:** Alexandra Wolf, University of Vienna, Austria

A large deal of the literature on mixed-methods (MM) research in learning and education discusses MM research designs. These attempts to capture MM research designs conceptually have been very helpful in proliferating the idea of MM research and making it somewhat easier to get started to use MM educational research. However, being conceptually derived, they remain abstract, which may limit their usefulness and impact. We use a novel approach to construct MM designs empirical in a specific field. We present data and highlight parallels to previous approaches to gauge MM research designs. Through this, we hope to inspire an in-depth discussion of how the approaches add to each other and how the empirical-derived designs generated using network methods can further inform MM research in learning and education.

University Teachers' Subjective Well-being and Achievement Goals: A Person-centered Analysis

Keywords: Higher Education, Motivation and Emotion, Quantitative Methods, Teaching/Instruction

Presenting Author: Raven Rinas, Augsburg University, Germany; **Co-Author:** Julia Hein, University of Mannheim, Germany; **Co-Author:** Stefan Janke, University of Mannheim, Germany; **Co-Author:** Oliver Dickhaeuser, University of Mannheim, Germany; **Co-Author:** Markus Dresel, University of Augsburg, Germany; **Co-Author:** Martin Daumiller, University of Augsburg, Germany

Research suggests that university teachers struggle with compromised subjective well-being (SWB) due to the challenging nature of their work. However, little evidence exists concerning how SWB is composed within teachers, and which personal antecedents (such as motivations in the form of achievement goals) influence this. Our research took a multi-faceted and person-centered approach to examining whether aspects of university teachers' SWB (emotions, burnout indicators, job satisfaction, and life satisfaction) interact within individuals to form meaningful profiles, and the role that their achievement goals may have in explaining likelihood of profile membership. To this end, we conducted latent profile analyses using data from 529 university teachers, yielding three unique SWB profiles: Profile 1 ($n=43$) and Profile 2 ($n=181$) both had moderate levels of anger, anxiety, and emotional exhaustion; however, Profile 2 had notably higher levels of job and life satisfaction. Lastly, Profile 3 ($n=305$) was characterized by the highest levels of joy, job satisfaction, life satisfaction, and personal accomplishment, as well as the lowest levels of anger, anxiety, emotional exhaustion, and depersonalization. Subsequent analyses indicated that task-approach goals were negatively, and relational goals were positively associated with Profile 1 membership. Next, learning- and work-avoidance goals were positively, and task-avoidance goals were negatively associated with Profile 2 membership. Lastly, learning-approach, task-approach, and task-avoidance goals were positively, and work-avoidance goals were negatively associated with Profile 3 membership. Taken together, these findings highlight the potential of a person-centered approach for interpreting heterogeneity in university teachers' SWB, and the relevance of their goals therein.

Predictors of Practicing with an Adaptive Arithmetic Learning Program

Keywords: At-risk Students, E-Learning/Online Learning, Motivation and Emotion, Student Learning

Presenting Author: Anna Hilz, IPN - Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:** Karin Guill, Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:** Janina Roloff-Bruchmann, IPN - Leibniz Institute for Science and Mathematics Education, Germany

Abstract *Adaptive practicing programs are a promising approach to foster calculation skills of students independently of their competence level. Theoretically based on the expectancy-value model, the predictive importance of family demographics and environmental conditions as well as self-schemata, emotions, prior achievement and personality were examined for the level and variability of use of an adaptive math practicing program. The variables were collected through a longitudinal field study from a total of 191 fifth-grade students from seven comprehensive schools in Germany. The usage frequency was measured weekly for every student over a period of 22 weeks. Conducting a multilevel analysis, math anxiety had a negative significant effect on the level of use while prior math knowledge predict a significant decrease of use.*

The role of social relatedness for drop-out intention in first semester STEM students

Keywords: Higher Education, Quantitative Methods, Self-efficacy, Social Aspects of Learning and Teaching

Presenting Author: Julia Eberle, Ruhr-Universität Bochum, Germany; **Co-Author:** Nicole Krämer, University of Duisburg-Essen, Germany; **Co-Author:** Nikol Rummel, Ruhr University Bochum, Germany

This study investigates whether different aspects of social relatedness (perceived social relatedness, social interaction and number of peers as social support) have different effects on higher education students' drop-out intentions and whether this effect is mediated by academic self-efficacy. Data of 132 STEM students, who participated in a panel study during their first semester, is used. The results show that only perceived social relatedness is related to drop-out intention and that this effect is fully mediated by academic self-efficacy. These findings support previous literature and imply that students need opportunities to develop a perception of social relatedness to their peers.

Measuring Adult Education Teachers' Beliefs about Teaching Language in a Globalized Society

Keywords: Attitudes and Beliefs, Language (Foreign and Second), Lifelong Learning, Survey Research

Presenting Author:Dörthe Herbrechter, Heidelberg University, Germany; **Co-Author:**Xenia Kuhn, German Institut for Adult Education, Germany

Active citizenship in a globalized society is strongly connected to individual language competence and to the capacity to communicate in different linguistical contexts. Therefore, developing and maintaining language competencies is one of the most important educational goal even after primary schooling. Findings from current educational research show that teachers' professional competence is largely responsible for the learning success of the participants. Beside knowledge and motivational orientation, teachers' beliefs about designing teaching actions appropriately are of particular importance for the quality of the pedagogical practice. However, research concerning adult education teachers' beliefs concerning teaching and learning in the domain of language learning is rare. To fill this gap, our study developed a measurement model for teachers' beliefs in Adult and Continuing Education (AE/CE) based on the COACTIV-model of teachers' pedagogical competence from Baumert & Kunter (2013) and an instrument to measure teachers' beliefs in AE/CE. The quality of the developed instrument was verified through a cognitive pre-test ($N=10$) and a confirmatory factor analysis (CFA) with a data set ($N=336$) from language teachers that are mainly employed at publicly funded adult education centres. The CFA confirmed the hypothetical stated factor model including beliefs about teaching and learning theories (further differentiated into constructivist and transmissive orientations) and epistemological beliefs (further differentiated into intuitive and professional beliefs). Descriptive results show that teachers in AE/CE have a mild tendency towards a transmissive orientation and largely possess professional epistemological beliefs. Furthermore, the findings suggest that the pedagogical background of teachers in AE/CE influences teachers' epistemological beliefs.

Session O 11

25 August 2021 17:30 - 18:30

Session Room 17

Espresso Paper

Higher Education, Instructional Design, Motivational, Social and Affective Processes

Learning Analytics

Keywords: Collaborative Learning, Educational Psychology, Educational Technology, Emotion and Affect, Higher Education, Instructional Design, Learning Analytics, Learning Technologies, Motivation, Motivation and Emotion, Quasi-experimental Research, Self-efficacy, Self-regulation

Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 08 - Motivation and Emotion

Chairperson: Leonie Jacob, University of Tübingen, Germany

Capturing motivation and affect using multimodal data: Toward theory-driven learning analytics

Keywords: Learning Analytics, Learning Technologies, Motivation and Emotion, Self-regulation

Presenting Author:Elizabeth Cloude, University of Central Florida, United States; **Co-Author:**Florence Gabriel, University of South Australia, Australia; **Co-Author:**Roger Azevedo, University of Central Florida, United States

Emerging technologies provide a platform for capturing rich information on the cognitive, affective, motivational, and metacognitive facets of self-regulated learning. Yet, significant gaps exist because few studies use contemporary models of self-regulated learning to drive methodological and analytical approaches, particularly when studying the role of motivation and affect on learning with emerging technologies. To address these issues, we will discuss theoretical, methodological, and analytical challenges in past and present work to guide future directions for fully representing the dynamic and temporal nature of self-regulated learning. Specifically, we will highlight novel approaches using multimodal learning analytics and discuss the potential for open-learner models and data visualizations to aid in not only capturing, but scaffolding motivational and affective processes which could be detrimental to self-regulated learning and performance with emerging technologies.

Studying emotional contagion in collaborative learning: Challenges and opportunities for LA research

Keywords: Collaborative Learning, Emotion and Affect, Learning Analytics, Learning Technologies

Presenting Author:Muhterem Dindar, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland; **Co-Author:**Sara Ahola, University of Oulu, Finland, Finland; **Co-Author:**Xiaohua Huang, University of Oulu, Finland; **Co-Author:**Guoying Zhao, University of Oulu, Finland

Collaborative learning is a socio-emotional process. The range of emotions exchanged among the collaborating students sets the group climate and influences task performance. However, there are specific methodological challenges in studying emotions in collaborative learning research. These challenges are due to the transient and short-lived characteristics of emotions. This study first discusses methodological challenges in capturing emotional states of collaborating students. Drawing on these challenges, the study addresses the potential for learning analytics and video-based facial emotions recognition analysis to unobtrusively capture collaborating students' emotions. Further, the study demonstrates a promising learning analytics (LA) method (i.e., cross-recurrence quantification analysis) in detecting the level of emotional contagion among the collaborators.

What can enactment of control during learning tell about students' motivation?

Keywords: Learning Analytics, Learning Technologies, Motivation, Self-regulation

Presenting Author:Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Anne Horvers, Radboud University Nijmegen, Netherlands; **Co-Author:**Rick Dijkstra, Radboud University Nijmegen, Netherlands

Students are increasingly learning with adaptive learning technologies that successfully adapt to students' cognitive development, but still largely ignore students' metacognitive and motivational processes. In order to better understand the interaction between these processes, this study investigates the association between students' enactment of control during learning and their motivation before and after. In a design study with 69 primary school students, we found great diversity in students' enactment of control both in the number of changes as well as the direction of changes made. Although we found no association between motivation prior to learning and change made, there were clear associations between the direction of control enactment during learning and motivation after learning. We found that a high relative change to easy problems relates to reduced interest/enjoyment and perceived competence and increased pressure and tension. At the same time, high relative change to difficult problems related to increased interest/enjoyment and perceived competence and reduced pressure and tension. Hence changes may not only provide insight in students' ability to enact control strategies, but may also reveal students' motivation. This bidirectional relation between control and motivation needs further exploration in experimental studies to better understand the possible value of enactment of control during learning as an indicator of motivation.

How Emotional Dispositions Influence the Online Learning Behaviour

Keywords: Emotion and Affect, Learning Analytics, Learning Technologies, Quasi-experimental Research

Presenting Author:Dirk Ifenthaler, University of Mannheim, Germany; **Co-Author:**Muhittin Sahin, University of Mannheim, Germany; **Co-Author:**Clara Schumacher, Humboldt-University Berlin, Germany

Advances of learning analytics approaches might be suitable to provide insights into digital learning behaviours without being intrusive. This paper reports a quasi-experimental study which explores the impact of state-emotions on the utilisation of learning artefacts and learning performance in digital learning environments. A total of 79 participants were assigned to three experimental groups (positive emotions, negative emotions, control group) in an online learning environment focusing on Crowdfunding. Findings revealed that induced emotions had an impact on the students online learning behaviours. Accordingly, when designing adaptive learning environments, learners' emotional states need to be considered in order to prompt them to their individual affective disposition.

Student engagement across academic paths: using LA as a support for study planning and monitoring

Keywords: Educational Psychology, Educational Technology, Learning Analytics, Self-efficacy

Presenting Author:Anni Silvola, University of Oulu, Finland; **Presenting Author:**Amanda Sjöblom, Aalto University, Finland; **Co-Author:**Sami-Santeri Svensk, Tampere University, Finland; **Co-Author:**Jiri Lallimo, Aalto University, Finland; **Co-Author:**Piia Naykki, University of Jyväskylä, Finland; **Co-Author:**Hanni Muukkonen, University of Oulu, Finland

This paper presents preliminary results about students' experiences of using LA visualizations as a support for study planning and progression monitoring. University students (N=104) participated in the study in which the developed service was studied with a high-fidelity prototype version. The focus of this study was on exploring students' experiences of using LA on the academic path level, while the main focus of the previous studies has been on course-level feedback. This study analyzes the effect of students' self-efficacy beliefs and ICT literacy skills on their experiences of using the LA visualizations. Preliminary results indicate that students with higher self-efficacy beliefs and with higher ICT literacy skills experienced the use of visualizations more useful than the students with lower self-efficacy and ICT literacy skills. Students had positive experiences of the designed visualizations as a support for study planning, while they also raised concerns about usability issues and the need for more information about study structures and planning processes. The preliminary results inform about the importance of involving students with different predispositions in developing LA tools. That is important to ensure relevant support for different learners and to facilitate equal engagement opportunities with the technologies intended to provide support for personal planning and progress monitoring as well as the development of regulatory skills.

Examining moderators of effects of dashboard feedback on learner motivation and performance

Keywords: Educational Technology, Higher Education, Instructional Design, Learning Analytics

Presenting Author:Anja Hawlitschek, Otto-von-Guericke-Universität Magdeburg, Germany; **Co-Author:**Galina Rudolf, TU Bergakademie Freiberg, Germany;

Co-Author:Sebastian Zug, TU Bergakademie Freiberg, Germany

Learning analytics information is mostly provided via dashboards. However, concerning an evidence-based instructional design and application of dashboards that are aligned to learners' needs, we are still at an early stage in research. The framing and the content of the dashboard feedback determine whether learner will benefit or whether undesired effects take place. A common element in instructional design of dashboards is competitive comparison with peers. However, dashboard feedback that is perceived as negative can frustrate learner or demotivate them. Cognitive and motivational learner characteristics moderate such effects. Students who perform well might perceive competitive features as motivating while low performers might be encouraged, especially if their ability beliefs are rather low. The aim of the current study is to uncover evidence on the relevance of motivational predispositions and cognitive characteristics of learners for the individual effects of dashboard feedback on learners' motivation and learning performance. To investigate this further, we compared the learning outcomes and motivational effects stemming from providing competitive versus content feedback via dashboard and examined the moderating effects of prior knowledge, goal orientations and ability beliefs. Results of our study indicate that prior knowledge moderates the effects of the two types of dashboard feedback. Students with low prior knowledge benefit from content dashboard feedback, students with high prior knowledge from competitive feedback. The results of our study point out the need to implement tailored dashboard interventions and to avoid one size fits all approaches that might support some students but handicap others.

Session O 12

25 August 2021 17:30 - 18:30

Session Room 12

Espresso Paper

Learning and Instructional Technology

Learning Technologies

Keywords: Computer-supported Collaborative Learning, Higher Education, Informal Learning, Inquiry Learning, Knowledge Creation, Learning Analytics, Learning Technologies, Science Education, Student Learning

Interest group: SIG 04 - Higher Education, SIG 20 - Inquiry Learning

Chairperson: Mathias Mejeh, University of Bern, Switzerland

University Students' Ecologies of Digital Resources. A mixed methods study

Keywords: Higher Education, Informal Learning, Learning Technologies, Student Learning

Presenting Author:Dan Uehara, University of Oslo, Faculty of Education, Norway; **Co-Author:**Crina Damsa, University of Oslo, Norway; **Co-Author:**Lise Toft Henriksen, University of Oslo, Norway

This contribution explored the way university students use digital technologies for their learning activities, and distinguished between technologies provided by their institution and external technologies students accessed on their own. It employed a sociomaterial perspective on learning, wherein digital technologies are viewed as potentially mediating learning activities. Participants in this mixed-methods exploratory study were university students in a large research university in Norway, enrolled in four study programs. The dataset consisted of reported use of various digital technologies, group interviews and a mini-ethnography that prompted students' in-depth reflections about digital technology use and its role in their study-related activities. The findings show a pattern in the use of institutionally provided and self-accessed technologies, and the fact that students themselves must generate mediating value from their interaction with these technologies. These findings invite further research about how digital technologies are intertwined with students' academic and non-academic activities, and how learning can be supported.

Different Levels of Guidance in Hands-on and Virtual Science Laboratories – What Works Best When?

Keywords: Inquiry Learning, Learning Technologies, Science Education, Student Learning

Presenting Author:Hasan Ozgur Kapici, Yildiz Technical University, Turkey; **Co-Author:**Hakan Akcay, Yildiz Technical University, Turkey; **Co-Author:**Hakki Cakir, Yildiz Technical University, Turkey

Inquiry-based learning can be an effective approach when students are provided with sufficient guidance. However, there is an ongoing debate among practitioners about the nature, type, and level of such guidance. This study investigated the effects on middle school students' ($N = 116$) conceptual knowledge and inquiry skills acquisition of providing varying levels of guidance in hands-on and virtual science laboratories on the topic of electricity. The study was based on a 2x2 between-subjects factorial quasi-experimental design. The effects of two different levels of guidance combined with either a hands-on or a virtual laboratory were examined. Findings revealed that although the level of guidance was important for students' conceptual knowledge development, it had no significant impact on their acquisition of inquiry skills. In terms of laboratory environments, it appears that a virtual laboratory can successfully replace a hands-on laboratory for development of middle school students' conceptual knowledge and inquiry skills.

How Virtual and Physical Manipulatives Affect Preschoolers' Understanding of Balancing a Scale

Keywords: Inquiry Learning, Learning Technologies, Science Education, Student Learning

Presenting Author:Yvoni Pavlou, University of Cyprus, Cyprus; **Co-Author:**Marios Papaevripidou, University of Cyprus, Cyprus; **Co-Author:**Zacharias Zacharia, University of Cyprus, Cyprus

The purpose of this study was to compare the impact of Physical (PM) and Virtual Manipulatives (VM) on preschoolers' conceptual understanding in the domain of balancing a scale while varying both the weight in each arm and the distance of the objects from the fulcrum. The participants were 88 preschoolers (age mean = 5.4) who were equally separated into two conditions according to the type of experimentation they used (PM/VM) during a semi-structured interview. The interview involved three phases (initial evaluation, experimentation, final evaluation), which followed the Predict-Observe-Explain strategy. Participants' responses to the interview were analyzed qualitatively and quantitatively. VM and PM appeared to have impacted on participants' understanding of the variables that affect the scale's balance, but no statistically significant differences were found between the two conditions learning-wise. Practical implications of these findings are discussed.

20 Years of Combining Physical and Virtual Experiments in Science Education: a Systematic Review

Keywords: Inquiry Learning, Learning Technologies, Science Education, Student Learning

Presenting Author:Salome Wörner, Leibniz-Institut für Wissensmedien (IWM) Tübingen, Germany; **Co-Author:**Jochen Kuhn, TU Kaiserslautern, Physics Education Research Group, Germany; **Co-Author:**Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany

Understanding scientific concepts is a fundamental aim of science education which can be fostered by conducting experiments. In various studies, combinations of physical (hands-on) and virtual (computer simulated) experiments have been shown to be helpful for gaining conceptual understanding in science. This systematic review provides an overview of 41 experimental studies published between 2000 and 2020. We address two research questions: (1) What is the relative effectiveness of combining physical and virtual experiments compared to one type of experimentation alone for conceptual understanding in science? (2) Which sequence of combinations of physical and virtual experiments is the most effective for conceptual understanding in science? The results of the reviewed studies indicate that (1) combinations of both types of experiments promote conceptual understanding in most cases better than one type of experimentation alone, but (2) there is no evidence that one sequence promotes conceptual understanding in science better than another. We conclude that for combinations of physical and virtual experiments, apart from the individual affordances of the single experiment types, especially their specific function within the learning task needs to be considered.

Promoting Scientific Practices and Collective Knowledge Advances through Idea-Friend Maps

Keywords: Computer-supported Collaborative Learning, Knowledge Creation, Learning Analytics, Science Education

Presenting Author:Xueqi Feng, The University of Hong Kong, China; **Co-Author:**Carol Chan, The University of Hong Kong, Hong Kong; **Co-Author:**Jan van Aalst, University of Hong Kong, Hong Kong

We examined a knowledge-building environment, mediated by a learning analytics tool "Idea-Friend Maps" (IFM), to scaffold authentic scientific practices and collective knowledge advances. Four Grade-Five students ($n=211$) learning *Human Input and Output* using Knowledge Forum participated, to pursue collective inquiries supported by IFM. As indicated by path analysis, students' epistemic understanding of knowledge building predicted their Knowledge Forum engagement, which in turn exerted influences on collective knowledge advances and individual scientific understanding. Further qualitative analysis showed how students engaged in authentic scientific practices and promoted collective knowledge advances with the support of IFM. This study sheds light on the use of opportunistic groups and learning analytics to scaffold young children to work as scientists in authentic scientific practices.

Session O 13

25 August 2021 17:30 - 18:30

Session Room 5

Espresso Paper

Cognitive Science, Learning and Instructional Technology, Learning and Social Interaction, Learning and Special Education

Primary Education

Keywords: Achievement, Case Studies, Cognitive Development, Cognitive Skills, Computer-assisted Learning, Educational Psychology, Educational Technology, Instructional Design, Learning and Developmental Difficulties, Mixed-method Research, Motivation, Peer Interaction, Primary Education, Psychometrics, Reasoning, Self-regulation, Teaching Approaches, Technology

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 10 - Social Interaction in Learning and Instruction, SIG 15 - Special Educational Needs, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Arthur Graesser, University of Memphis, United States

Teachers' responses toward bullying questionnaire: A cross-country validation study

Keywords: Peer Interaction, Primary Education, Psychometrics, Teaching Approaches

Presenting Author:Fleur van Gils, KU LEUVEN, Belgium; **Co-Author:**Hilde Colpin, KU LEUVEN, Belgium; **Co-Author:**Karine Verschueren, KU Leuven, Belgium; **Co-Author:**Ersilia Menesini, University of Florence, Italy; **Co-Author:**Benedetta Emanuela Palladino, University of Florence, Italy

Given the high prevalence and dramatic impact of being bullied at school, it is crucial to get more insight into how teachers can reduce bullying. So far, very few instruments are available to measure elementary teachers' strategies of intervening in bullying, especially from the students' point of view. Therefore, this study investigated the validity of the student-reported Teachers' responses toward bullying questionnaire (Campaert et al., 2017; Nappa et al., 2020). The factor structure of the questionnaire and measurement invariance were tested across two educational contexts, in fourth and fifth grade elementary students ($N = 902$) from Italy and Belgium. Furthermore, the associations between student-perceived teachers' responses and students' self-reported and peer-nominated bullying were examined. Confirmatory factor analyses supported the predicted five-factor structure of the questionnaire, distinguishing Non-Intervention, Mediation, Group Discussion, Supporting the Victim, and Disciplinary Methods. Evidence was found for a partial factor means invariance model, allowing us to make valid comparisons between the Italian and Belgian groups. Significant associations were found in the expected directions between self-reported bullying and the teachers' responses, except for Group Discussion. However, no significant associations were found between peer-nominated bullying and the teachers' responses. Overall, this study provides evidence for both the five-factor structure of the Teachers' responses toward bullying questionnaire in different educational contexts and associations between student-perceived teachers' responses and self-reported bullying.

Cognitive skills, task-interest and self-beliefs in children with dysfluency in reading and math

Keywords: Cognitive Skills, Learning and Developmental Difficulties, Motivation, Primary Education

Presenting Author:Jenni Puttonen, University of Jyväskylä, Finland; **Co-Author:**Mikko Aro, University of Jyväskylä, Finland; **Co-Author:**Kenneth Eklund, University of Jyväskylä, Finland; **Co-Author:**George Georgiou, University of Alberta, Canada; **Co-Author:**Riikka Heikkilä, University of Jyväskylä, Finland; **Co-Author:**Tuire Koponen, University of Jyväskylä, Finland; **Co-Author:**Jonna Salminen, City of Jyväskylä, Finland; **Co-Author:**Victor van Daal, Edge Hill University, United Kingdom

Both reading and arithmetic difficulties are characterised by poor fluency, and about one third of the children with either of the problems seem to have dysfluency in both skills. We aimed at examining development of cognitive and motivational characteristics in children with single and, so far rarely studied, comorbid reading and arithmetic difficulties. The participants of this study were 197 Finnish children followed semi-annually from Grade 1 to Grade 3. We focused on children with persistent reading ($n=14$), arithmetic ($n=16$) or comorbid ($n=25$) fluency difficulties at 3rd grade. These groups were compared in all assessment points with regard to cognitive skills, domain-specific interests, self-efficacy and self-concept. The majority of children's arithmetic and comorbid fluency problems at Grade 3 were identifiable already at Grade 1 Spring, whereas children with reading fluency difficulties could be reliably identified from Grade 2 Fall. Children in all deficit groups scored consistently lower in rapid naming and counting tasks than their typically developing peers. Early weaknesses in number comparison, processing speed and working memory tasks were observed in children with arithmetic problems. Children with comorbid difficulties showed weaknesses in all cognitive measures throughout the assessment period. Low domain-specific self-efficacy and academic self-concept were observed in all deficit groups already during Grades 1 or 2. The findings suggest that problems in rapid naming and counting are related to dysfluency in both reading and arithmetic. In general, arithmetic difficulties were associated with broader cognitive deficiencies than reading difficulties. Low academic self-beliefs were restricted to the domain affected.

Is children's social networking site usage linked to academic achievement?

Keywords: Achievement, Mixed-method Research, Primary Education, Technology

Presenting Author:Athanasia Kotsiou, University of Cambridge, UK, United Kingdom; **Co-Author:**Rupert Wegerif, University of Cambridge, United Kingdom

Children are increasingly using social networking sites (SNS), which has given rise to concerns about the effects on their learning and academic performance. While the literature with secondary school and university students indicates predominantly negative associations between SNS use and academic performance, there is little evidence for elementary school children. This paper fills in this gap by examining the links between elementary school children's self-reported SNS use and academic performance in English, Spelling and Maths. It reports on a large study with children aged 9-11 years old in England. Independent sample t-tests indicated that SNS users had significantly lower scores in all these subjects compared to non-users. Furthermore, those who have used SNS for more than one year had significantly lower scores in English and Spelling compared to SNS users for less than one year. These results were complemented with semi-structured interviews with heavy SNS users. Thematic analysis corroborated these findings, with children attributing the negative impact on grades to the

distracting role of notifications and excessive SNS use. At the same time, however, SNS appeared to contribute to a broader sense of learning by strengthening citizenship and critical thinking skills, while providing valuable opportunities for staying informed about the world. There is a call for additional research with longitudinal data and further metrics of SNS usage to further illustrate the mechanisms involved.

Exploring how co-located microblogging can support young students' collaborative reasoning

Keywords: Case Studies, Educational Technology, Primary Education, Reasoning

Presenting Author:Anja Amundrud, University of Oslo, Norway; **Co-Author:**Ingvill Rasmussen, University of Oslo, Norway; **Co-Author:**Ole Smørås, Department of Education, Norway

This article explores the potential of microblogging in supporting activities intended to engage primary school students in classroom interactions where they learn about, and practice collaborative reasoning. For students to develop into active participants of uncertain future societies, they need to learn how to become critical thinkers, and to reason systematically, which benefits from being developed in interaction with others (Mercer & Littleton, 2007; Reznitskaya & Wilkinson, 2017). Microblogging tools hold the potential to facilitate such interactions allowing flexible collaborations and sharing of ideas among participants. Studies of microblogging have mostly been conducted in higher education (Tang & Hew, 2017), and despite promising results, few studies have explored the potential of such tools for developing primary school students' collaborative reasoning. In order to investigate this phenomenon, we conduct a case study where we examine what characterises the role of a microblogging tool used within a specific classroom activity designed to engage students' in collaborative reasoning. Our findings indicate that the designed activity, and how the microblogging tool mediated dialogue and sharing of ideas, offer students opportunities to engage critically with each other's perspectives, provides new possibilities for participation in interactions where students make their reasoning and thinking explicit to each other. Furthermore, by systematically make students aware of their peers' opinions enable them to build collective ideas. Especially, the creative use of a concept tagging activity (hash-tagging in social media) proved to be a suitable resource in order to facilitate interactions where students practice collaborative reasoning.

Individual Differences in Rate of Improvement during a Spatial Task Predict Future Spatial Learning

Keywords: Achievement, Cognitive Development, Cognitive Skills, Educational Psychology

Presenting Author:Emily Grossnickle Peterson, American University, United States

Spatial thinking is important for learning across a wide range of academic and professional tasks, especially those related to science, technology, engineering, and mathematics (STEM). There is evidence that spatial thinking can improve in response to training and educational opportunities. Yet, the extent to which individuals improve spatial skills more (or less) quickly than others has been underexplored. Therefore, in the present study we examined individual differences in the rate of improvement during a common spatial task (i.e., mental rotation) and assessed whether the rate of improvement during the task predicted improvement in spatial skills following a year of secondary education. Mixed effects multilevel modeling with test items nested within participants (N=209) indicated that individuals tended to respond more accurately and faster from the beginning to the end of the test. Including a random effects coefficient to account for individual differences in the rate of improvement during the task revealed meaningful variation among individuals in how quickly they improve during the task. Rate of improvement during the mental rotation task administered at the beginning of the school year predicted mental rotation task performance at the end of the year, even after accounting for pretest performance, sex, and whether students participated in a spatial learning course. Results suggest that individual differences in the rate of improvement during a spatial task, even without feedback, can provide important information about the extent to which students experience longer-term improvements in spatial skills.

How are pupils' self-regulated learning profiles and tablet computer use for learning related?

Keywords: Computer-assisted Learning, Instructional Design, Primary Education, Self-regulation

Presenting Author:Laura Hirsto, University of Eastern Finland, Finland

Earlier research had shown contradictory results on the effects of the use of tablets and iPads in education for learning. According to earlier research, many pupils have positive attitudes towards working with tablet computers, and that pupils enjoy working with tablets (e.g. Dundar & Akcayir, 2012; Huang et al., 2012). It also seems that pupils are not having trouble in adjusting to the tablet computer use in the learning contexts. The aim of this study was to investigate primary and secondary pupils' experiences of the use of tablet computers in the teaching-learning environment and of pedagogy supporting self-regulation in relation to their self-regulated learning profiles. According to results, varying self-regulated learning profiles can be found among pupils, and these profiles are related to pupils experiences of tablet use in the teaching-learning environment and that tablet use seems to be related to teachers' pedagogical practices of supporting pupils self-regulation skills.

Session O 14

25 August 2021 17:30 - 18:30

Session Room 14

Espresso Symposium

Teaching and Teacher Education

Growth mindset and effective schooling in different contexts

Keywords: Attitudes and Beliefs, Communities of Learners, Educational Psychology, Mathematics, Motivation, Multicultural Education, Qualitative Methods, Quantitative Methods, Teacher Effectiveness, Teaching/Instruction

Interest group:

Chairperson: Maria Tulis, University of Salzburg, Austria

Organiser: Maria Tulis, University of Salzburg, Austria

Discussant: Pia Kreijkes, University of Cambridge, United Kingdom

Discussant: Nienke van Atteveldt, Vrije Universiteit Amsterdam, Netherlands

Mindset theory is a theoretical framework with a range of implications for learning. The manner and extent of the contribution the various stakeholders within a school context (principals, teachers, students, parents) may make to growth mindsets, and the impact of these contributions on student performance, remain controversial. This symposium will seek to analyze growth mindset cultures in schools, drawing on findings from studies that take experimental, qualitative (interview, observation) and cross-sectional quantitative approaches. In the first of these, *Tulis, Harnisch and Bernhard* explore indicators of growth mindsets, specifically adaptive responses to challenges and learning from failure and feedback received, in interviews with principals of English schools in deprived areas that achieved exceptional improvements in their students' academic attainment. In the second, *Yu, Kreijkes and Salmela-Aro* collected data from principals, teachers, and primary school children in Finland to investigate relationships between students' growth mindsets, teachers' beliefs and instructional practices, and characteristics of schools. The third study is *Zeeb and Voss'* examination of feedback-giving practices among teachers in Germany, which highlights the importance of praise for effort and growth mindset-oriented feedback in ethnically and culturally diverse classes. Finally, the fourth study (*De Ruiter*) presents a coding system for assessments of mindset-oriented verbalizations in student-teacher interactions. Together, this symposium informs the ongoing discussion addressing aspects of growth mindset in educational settings. We will allocate time to a facilitated discussion of the implications for research and teacher education, supplemented by additional ideas from related mindset research conducted by our two discussants (*Van Atteveldt, Kreijkes*).

Adaptive orientations towards failure and growth mindset in effective schools in difficult contexts

Presenting Author:Maria Tulis, University of Salzburg, Austria; **Co-Author:**Dominik Harnisch, University of Salzburg, Austria; **Co-Author:**Roland Bernhard, University of Salzburg, Austria

Commencing in the early 2000s, schools with large proportions of disadvantaged students in London and other English regions have experienced processes generating marked improvement. In order to explore how indicators of growth mindset may contribute to this improvement we analyzed interviews with 18 leaders from schools that have experienced exceptional improvements since 2003. Specifically, we identified adaptive beliefs about failure as an opportunity for

learning and improvement as being present in school leaders' narratives about their approaches to school quality development at a range of levels (leadership, teachers, students, work with parents). The interviewees expressed their view of mistakes and failure as valuable learning opportunities in several ways and in relation to various aspects of school life. The study's contribution to this field resides in its identification of adaptive beliefs about failure as an important element of growth mindset in effective schools working in difficult circumstances. Further, it supports existing findings on different dimensions of error-climate above and beyond the classroom, and it highlights the importance of adaptive beliefs about failure in improvements in schools' performance.

Students' growth mindset: Relation to teacher beliefs, teaching practices, and school climate

Presenting Author:Junlin Yu, University of Helsinki, Finland; **Co-Author:**Pia Kreijkens, University of Cambridge, United Kingdom; **Co-Author:**Katariina Salmela-Aro, Helsinki University, Finland

How can teachers and schools create a supportive context for growth mindset development? The current study links students' growth mindset to teachers' beliefs, instructional practices, and school climate. Participants were 2,200 ten-year-old students, along with 358 teachers and 65 principals in Finland. Multilevel analyses revealed that students had a stronger growth mindset in classrooms where teachers used guided inquiry and in schools that holistically supported students' social-emotional development beyond academic outcomes. In contrast, students reported a stronger fixed mindset in classrooms where teachers differentiated tasks based on students' performance. The findings pinpoint potential channels through which teachers and schools can promote a growth mindset in students.

Well-intentioned but dysfunctional: Teachers' feedback to students with a migrant background

Presenting Author:Helene Zeeb, University of Freiburg, Germany; **Co-Author:**Thamar Voss, University of Freiburg, Germany

Teachers' feedback is a powerful tool to foster students' growth mindsets and motivation. However, even well-intentioned feedback can have unwanted negative effects, for example by communicating low expectations or fostering fixed mindsets. Two kinds of such dysfunctional praise are *ability praise* and *effort praise* in situations when students have not or unsuccessfully invested effort. Previous research has shown that feedback is affected by students' ethnic background: Teachers tend to praise students with a migrant background more often than students without a migrant background (i.e., *positive feedback bias*). In an experimental study, we investigated this feedback bias with respect to dysfunctional ability and effort praise among teachers from German schools ($N = 186$). Teachers read descriptions of classroom situations and indicated their likelihood of conveying ability praise, effort praise, or control praise. The target student had either a German name or an Arab name. The results showed that teachers tended to provide more dysfunctional praise to students with a migrant background than to students without a migrant background. Dysfunctional praise was predicted by teachers' multicultural beliefs and their prejudices towards students with a migrant background but not by teachers' growth mindsets. We conclude that teachers need support to become aware of behavioral biases and unintentional effects of feedback, in order to foster growth mindsets and motivation among all students.

"Doing" mindsets in classrooms: A coding scheme for teacher-student mindset-related verbalizations

Presenting Author:Naomi de Ruiter, University of Groningen, Netherlands

Mindset researchers are increasingly stressing that teachers' feedback, praise, and criticism play an important role in the socialization of growth and fixed mindsets in children. The methodological tools for studying the process of socialization *as it occurs* are limited, however. Zooming in on these processes *in situ* will be necessary to gain a richer understanding of how teachers and students co-regulate each other with regard to their mindset-related verbalizations. In this talk, I will introduce a coding scheme that can be used to systematically study teacher and student mindset-related verbalizations in the classroom: the student teacher mindset (STEAM) coding scheme. The coding scheme is comprehensive, in that it enables researchers to study all forms of teacher and student talk that express growth or fixed mindset assumptions. The coding scheme was developed to study these verbalizations in Science, Technology, Engineering, and Mathematics (STEM) contexts. The coding scheme has been tested for inter-rater reliability, and demonstrates content and ecological validity. I will demonstrate its utility with a case study, showing how the output from the STEAM coding scheme allow researchers to examine moment-to-moment dynamics that occur between teachers' and students' mindset-related verbalizations. In our case study, we found that teacher and student mindset talk demonstrated a high level of temporal association (moving correlation = 0.63 between the two time series), and that this association was based on co-regulation. The case study highlights interesting directions for future research.

Session O 15

25 August 2021 17:30 - 18:30

Session Room 8

Espresso Symposium

Teaching and Teacher Education

Using student feedback for teaching development and teacher professionalization in schools

Keywords: Assessment Methods and Tools, Educational Technology, Experimental Studies, In-service Teacher Education, Meta-analysis, Pre-service Teacher Education, Reflection, Teacher Effectiveness, Teacher Professional Development

Interest group: SIG 18 - Educational Effectiveness and Improvement

Chairperson: Sebastian Röhl, University of Tübingen, Germany

Chairperson: Wolfram Rollett, University of Education Freiburg , Germany

Organiser: Sebastian Röhl, University of Tübingen, Germany

Organiser: Wolfram Rollett, University of Education Freiburg , Germany

Discussant: Adrie Visscher, Univ. of Twente, Netherlands

Many authors see student feedback on teaching as a very useful instrument for the professional development of teachers and their teaching (e.g. Zierer & Wisniewski, 2019). Feedback thus provides information on students' perceptions of teaching and classes, which can be used for professional reflection by teachers and for discussions with the students about the lessons (Gaertner, 2014). Based on this, areas for improvement can be identified and implemented. Furthermore, teacher professionalization activities can be initiated (Flutter, 2007). This symposium focuses on the effects of student feedback on the development of teaching quality and teacher professionalization in schools. In particular, paper one presents the findings of a meta-analysis of the effects of student feedback intervention studies on teaching quality. The second paper focuses on the use of smartphone-based student feedback in the classroom and the associated effects on the teacher and their teaching. The third contribution analyzes the effects of student feedback in the practical phases of teacher training on the attitudes of student-teachers towards reflection and student feedback.

Effects of student feedback on teaching quality in schools – a meta-analysis

Presenting Author:Sebastian Röhl, University of Tubingen, Germany

This paper provides a meta-analysis on effects of student feedback intervention studies in schools. This is based on a comprehensive literature review, which includes 18 longitudinal studies. To measure the intervention effects, all of these studies use students' perceived quality of instruction before and after the feedback intervention. Therefore, this variable was chosen as a dependent variable for the meta-analysis. Analysis using a random-effects model pointed to a small but significant positive weighted mean effect size of $d=0.21$. As the included studies varied in the extent of additional teacher support, the number of feedback reports, and the duration of the intervention, in-depth moderator analyses in this regard were conducted. Results pointed to a significant beneficial effect of individual support measures for teachers regarding reflection and subsequent development. No significant effects were found for the other moderators. Implications for further research and practical implementation of student feedback in schools are discussed.

Does smartphone-assisted student feedback affect teaching quality?

Presenting Author:Hannah Bijlsma, University of Twente, Netherlands; **Co-Author:**Adrie Visscher, Univ. of Twente, Netherlands

In this study, student perceptions of teaching quality were measured by means of a smartphone application for providing teachers with feedback on their lesson.

It was investigated if student feedback promoted teachers' insight into where there is room for improvement of their lessons, and whether they reflect more on their lessons. It was also investigated in what ways teachers worked on improvement, and whether the student feedback affected the quality of their teaching. Teachers reported that they gained insight into their improvements based on the student feedback. They did not seem to reflect statistically significant more on their lessons. Teachers reported improvement-oriented actions in response to the student feedback. According to students, teachers first slightly improved their teaching quality. However, the improvement did not sustain. Explanations for the findings are discussed and suggestions for future research are presented.

Pre-service teachers' attitudes towards student feedback and reflection in Germany and Switzerland

Presenting Author:Corinne Wyss, FHNW School of Education, Switzerland; **Co-Author:**Kerstin Göbel, University of Duisburg-Essen, Germany; **Co-Author:**Katharina Neuber, University of Duisburg-Essen, Germany; **Co-Author:**Meike Raaflaub, Pädagogische Hochschule Zürich, Switzerland

The ability and willingness to professionally reflect are characteristics of teachers' professionalism and are meant to be promoted in teacher training. Student feedback on teaching can support teacher reflection on teaching, as it expands teachers' perspective in a meaningful way. Still, student feedback has rarely been used for teacher reflection processes in the practical phases of teacher training and has hardly been empirically investigated so far. This paper focuses on teachers' attitudes towards student feedback and teachers' reflections on teaching, of pre-service teachers in Germany and Switzerland. In both countries, pre-service teachers collected student feedback on their teaching during their school internship and reflected upon the student feedback received, using reflective journals and collegial settings. The findings illustrate positive attitudes of pre-service teachers from both countries towards student feedback, professional reflection and collegial reflection settings. Findings also point to differences in the attitudes between the two contexts, which might be the result of different designs of teacher training programs.

Session O 16

25 August 2021 17:30 - 18:30

Session Room 9

Espresso Symposium

Teaching and Teacher Education

Empowerment of teachers for technology-enhanced teaching: Boundary conditions and strategies

Keywords: Educational Technology, In-service Teacher Education, Inquiry Learning, Meta-analysis, Pre-service Teacher Education, Quasi-experimental Research, Science Education, Teaching/Instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Jürgen Schneider, University of Tübingen, Germany

Organiser: Iris Backfisch, University of Tuebingen, Germany

Organiser: Armin Fabian, University of Tuebingen, Germany

Discussant: Jo Tondeur, Vrije Universiteit Brussel, Belgium

The use of technologies in classrooms is sought to be a crucial aspect to enhance teaching and learning processes as well as to prepare students for the demands of the 21st century. Recent research showed that there are several boundary conditions that constrain technology use in schools, such as contextual aspects (e.g., infra-structure), and teachers' professional knowledge (i.e., Technological Pedagogical Content knowledge, TPACK; Mishra & Koehler, 2006). However, still to date, little attention has been paid to the systematization of these boundary conditions and strategies to assess teachers' technological pedagogical content knowledge. Furthermore, it is unclear how teachers can be supported to develop deep-level TPACK. Against this background, the present symposium provides insights into these crucial aspects on how to empower teachers for technology-enhanced teaching. The first two contributions are systematic research syntheses which provide new insights into the significance of contextual aspects as well as conceptual understanding of teachers' knowledge. The remaining two contributions will present results from complementary endeavors within pre-service teacher education in Finland and Germany. Whereas the Finish project focused on technology-enhanced inquiry-based science education, the German project was more generic and aimed at enhancing pre-service teachers' knowledge to integrate technologies into their subject-matter teaching across five subject-matter pedagogies. Together, the four presentations provide a comprehensive foundation to enable an evidence-based discussion on future research projects that are based on both, scientific evidence and practical feasibility to comprehensively inform educational practice.

TPACK and Contextual Knowledge: Unpacking that mysterious outer circle

Presenting Author:Eliana Brianza, University of Zurich, Institute of Education, Switzerland; **Co-Author:**Mirjam Schmid, University of Zurich, Switzerland; **Co-Author:**Dominik Petko, University of Zurich, Switzerland

Technological pedagogical content knowledge (TPACK) is one of the most prominent frameworks for technology integration. Since its proposal in the original framework has remade unchanged, but for one exception: an outer dotted line labeled "contexts" introduced to represent TPACK's situated nature. To date, this construct has not only remained vaguely and diversely defined across the literature, but it has been interchangeably considered as both the conditions and setting affecting teachers' knowledge as well as what teachers actually know about the contexts they work in. Only recently, in 2019, Mishra emphasized the need for a conceptual consistency within the framework and upgraded "context" to "contextual knowledge". The focus of this systematic review is to provide an overview of the definitions and relevance of contextual knowledge present in the TPACK literature. The review investigating contextual knowledge consists of two parts: 1) a preliminary analysis of the 70 context-relevant articles published between 2005 and 2013 reported by Rosenberg & Koehler (2015); 2) a systematic review of the literature from 2014 to 2020. Eligible records are coded in relation to the context framework proposed by Porras-Hernández and Salinas-Amescua (2013). First findings show that, as a form of knowledge, context is infrequently and diversely considered in TPACK research. The construct emerges under various labels and is inconsistently understood as an integral or distinct component within the TPACK framework. Based on the diversity of the construct, the benefits of a finer framework for representing and comparing this construct across the literature are discussed.

Another jangle fallacy? Validity of Technological Pedagogical Content Knowledge self-reports

Presenting Author:Jürgen Schneider, University of Tübingen, Germany; **Co-Author:**Iris Backfisch, University of Tuebingen, Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany; **Co-Author:**Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Ronny Scherer, University of Oslo, Norway

Mishra and Koehler (2006) introduced the Technological-Pedagogical Content-Knowledge (TPACK) framework to describe knowledge components teachers need to successfully integrate technologies in their teaching. This framework has been frequently adopted in a plethora of studies assessing the availability of teachers' TPACK predominantly by means of self-reports. However, self-reports have been increasingly criticized for not measuring actual professional knowledge, and researchers have recently argued that TPACK self-reports rather measure self-efficacy beliefs. In this respect, the use of self-report TPACK might induce a jangle fallacy and, therefore, mix up divergent constructs and measures. Accordingly, self-report TPACK and self-efficacy beliefs toward technology-enhanced teaching might be strongly related constructs with comparable implications on teachers' technology integration. Against this background, we conducted a meta-analysis to systematically investigate the validity evidence of teachers' self-reported TPACK and potential overlaps with technological self-efficacy beliefs. The analyses indicated that self-report TPACK and self-efficacy beliefs towards teaching with technology overlap to a large extent, particularly, within pre-service teachers. Therefore, the results suggest that researchers should be more reluctant when using self-report TPACK as knowledge measures, and prefer performance assessments to measure teachers' actual TPACK.

What pre-service teachers gain from a teacher training course? TPACK perspective

Presenting Author:Teemu Valtonen, University of Eastern Finland, Finland; **Co-Author:**Miikka Eriksson, University of Eastern Finland, Finland; **Co-Author:**Sirpa Kärkkäinen, University of Eastern Finland, Finland; **Co-Author:**Ville Tahvanainen, University of Eastern Finland, Finland; **Co-Author:**Erkko Sointu, University of Eastern Finland, Finland; **Co-Author:**Anni Turunen, University of Eastern Finland, Finland

This paper focuses on pre-service teachers' Technological Pedagogical Content Knowledge. Presentation outlines, what are the elements that pre-service teachers grasp on during a normal teacher training course from the perspective of the TPACK framework. The context of the study was a five-credit teacher training course "Inquiry-based science education" including lectures, exercises and a nature trail. Various educational technology tools and applications were used for supporting learning. After the course pre-service teachers (n=165) outlined what were the most important aspect during the course that supported their professional development. Results indicate that pre-service teachers mainly grasped on themes related to pedagogical knowledge (707 mentions) like inquiry learning, laboratory activities, the importance of considering the pupils with different learning needs and using the nature as a learning environment. The second category, Content knowledge (239 mentions) indicated that respondents had learned biology contents and laboratory activities. The Technology knowledge category (65 mentions) focused on a general level of ideas how to use ICT in education. Few mentions focused on using cloud services and applications used outside the classroom.

Fostering Technology Integration of Pre-Service Teachers: A Quasi-experimental field study

Presenting Author:Armin Fabian, University of Tuebingen, Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany; **Co-Author:**Ulrike Franke, University of Tuebingen, Germany; **Co-Author:**Judith Preiss, University of Tuebingen, Germany

Against the backdrop of preparing students for a digitized future, supporting pre-service teachers' development of Technological-Pedagogical-Content Knowledge (TPACK) has become paramount in pre-service teacher education. Whether and how pre-service teachers' acquisition of TPACK could be supported is still an open question, however. We developed an evidence-based TPACK-intervention (duration: three weeks) to support pre-service teachers' acquisition of TPACK. Pre-service teachers ($N = 208$), enrolled in five different subjects across two cohorts, either received the subject-specific TPACK-intervention or business-as-usual instruction (control condition). We found that pre-service teachers in the TPACK-intervention acquired more professional knowledge (i.e., TPACK) than those in the control condition. Significant effects were also obtained for pre-service teachers' technology-related self-efficacy. The findings highlight the central role of adequate support for pre-service teachers' development of technology-related professional knowledge in teacher education programs.

Session O 17

25 August 2021 17:30 - 18:30

Session Room 10

Espresso Symposium

Developmental Aspects of Instruction, Instructional Design, Learning and Instructional Technology

Understanding and fostering early metacognition and SRL: Effects of exercises, beliefs and feedback

Keywords: Cognitive Development, Developmental Processes, Early Childhood Education, Instructional Design, Mathematics, Metacognition, Motivation, Primary Education, Self-regulation

Interest group: SIG 16 - Metacognition

Chairperson: Mariette van Loon, University of Bern, Switzerland

Discussant: Nancy Perry, University of British Columbia, Canada

In this symposium, we present and discuss factors affecting children's self-monitoring accuracy and self-regulation, and the relations between monitoring, regulation, and performance. Study 1 implemented monitoring exercises over the course of seven weeks in 5th-grade children's math classes. Preliminary analyses seem to indicate that practicing monitoring exercises had benefits for self-monitoring accuracy. Study 2 showed that kindergartners have distinct beliefs about whether willpower is a limited or a non-limited resource. Self-regulation was less effective for children who believed that willpower was limited. Study 3 investigated 5th-graders' decisions about adapting task difficulty when they were completing math tasks with adaptive learning technologies. Based on trace data, children were given advice about how they could adjust difficulty. Although children used this advice, they also seemed to rely on their own self-monitoring when making SRL decisions. Study 4 showed a directional relation between monitoring accuracy, online SRL (measured with study time allocation, restudy selections, and task persistence) and performance when 4th and 6th-grade children studied concepts. Further, direct effects of monitoring accuracy on task performance were stronger for 6th than 4th graders. In sum, the presented research shows that children's self-monitoring accuracy (Study 1) and motivational beliefs (Study 2) affect SRL. Self-monitoring accuracy can benefit from monitoring exercises (Study 1) and self-regulation can be supported with advice based on trace-data (Study 3). Further, findings show a directional monitoring - SRL - performance relation, and indicates that this relation may be stronger for older children (Study 4).

Effects of monitoring exercises, feedback, incentives and modeling on students' calibration

Presenting Author:Engin Ader, Boğaziçi University, Turkey; **Co-Author:**Kubra Ture, Bogazici University, Turkey

This quasi-experimental study aims to analyze the effect of monitoring exercises, feedback, incentives and teacher modeling on calibration of 5th grade students' judgments about their mathematics performance. The study involved 2 intervention groups and one control group. One of the intervention groups (intervention 1) was administered repeated monitoring exercises, feedback, incentives and teacher modeling whereas the second intervention group (intervention 2) was given only repeated monitoring exercises. These interventions were implemented for 7 weeks in mathematics classes at a state school in Turkey. The sample consisted of 75 5th graders. 3 classes were randomly assigned to study groups. ANCOVA was used to analyze the difference between the calibration scores of the three groups at the end of the intervention period since there was significant difference between the groups at the beginning of the intervention. Preliminary analysis showed that median of calibration scores had significant differences in terms of the combined effect of time and type of group on calibration of students.

My brain needs a break: Children's willpower theories are related to behavioral self-regulation

Presenting Author:Miriam Compagnoni, University of Zurich, Switzerland; **Co-Author:**Vanda Sieber, University of Zurich, Switzerland; **Co-Author:**Veronika Job, Technische Universitaet Dresden, Germany

Is the way kindergarteners think about their willpower—whether it is a limited or nonlimited resource—related to their motivation and behavioral self-regulation? The present study is the first to examine the structure of beliefs about willpower in relation to learning goal orientation and behavioral self-regulation (SR) by interviewing 147 kindergarteners (51% female) aged 5 to 7 years ($M = 6.47$, $SD = .39$). A new instrument was developed to assess willpower theories for this specific age group. Behavioral SR was assessed with a direct behavioral measure (head-toes-knees-shoulder task) and learning goal orientation was assessed by self-report. Results indicated that kindergarteners who think of their willpower as a nonlimited resource show better behavioral SR than children that adopt a limited theory, even when controlling for age, gender and academic ability level. Behavioral SR was especially impaired by a limited theory among low achieving children. Further, results showed that although implicit theories about willpower are related to an adoption of a learning goal orientation, they show a unique relation to behavioral SR. Findings suggest that fostering metacognitive beliefs in children, such as the belief that willpower is a nonlimited resource, may foster behavioral self-regulation for successful adjustment to the demands of kindergarten and school.

Young learners' use of increased autonomy and personalized visualizations to regulate learning

Presenting Author:Anne Horvers, Radboud University Nijmegen, Netherlands; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Rick Dijkstra, Radboud University, Netherlands

Although research indicates positive effects of Adaptive Learning Technologies (ALTs) on learning, we know little about how young learners regulate their learning in these contexts. Research shows that personalized visualizations can influence how students regulate their learning, but they fail to increase learners agency. Therefore in this study, we gave students the opportunity to change the difficulty level of problems. In this way, learners agency over their regulation

process was increased and they received more autonomy to enact effective regulation. We report on a design study that explored how students use the opportunity to adjust difficulty of problems while they learn math with an ALT. We found diversity in the number of easy, intermediate and difficulty problems students made. On average, students changed the difficulty level once per lesson, but the range was between 0 and 6 times. We found that personalized visualizations served as a scaffold for students to determine the direction of changes. Students followed the advice of the personalized visualizations in 59% of the time. In case of deviating adjustments, the difficulty was decreased in two third and increased one third of the cases. These results showed that young learners did use the increased autonomy to change the difficulty level of practice behavior. However, they did not always follow the scaffolds in the personalized visualizations and also seem to enact on self-evaluation to drive regulatory actions in ALTs.

Relations between monitoring accuracy, SRL, and performance for fourth and sixth graders

Presenting Author:Mariette van Loon, University of Bern, Switzerland; **Co-Author:**Niamh Oeri, University of Bern, Switzerland

Models on self-regulated learning (SRL) emphasize the importance of monitoring accuracy and effective allocation of study time, restudy, and task persistence for performance. However, it remains unclear to what extent children's online SRL during work on educational tasks is affected by self-monitoring accuracy, whether (and which) components of children's online SRL predict learning performance, and to what extent developmental differences affect the relation between monitoring, SRL, and performance. This study aimed to address these research gaps. Elementary school children ($n = 198$, 94 fourth and 104 sixth graders) self-regulated their learning of difficult concepts; they could decide themselves how they allocated study time, what they restudied, and how long they liked to persist with the task. Results show that monitoring accuracy affected the effectiveness of restudy, but monitoring accuracy did not affect allocation of study time and persistence. All three components of SRL (i.e., study time allocation, effective restudy, and persistence) affected task performance. Further, for 6th graders, persistence and monitoring accuracy more strongly affected performance than for 4th graders. Findings show the directional relation between monitoring accuracy, SRL, and performance for two age groups of elementary school children, and the difference between 4th and 6th graders for direct effects of monitoring accuracy on performance. Findings that SRL components have strong and independent effects on performance over and above effects of monitoring accuracy indicate the necessity of teaching children about different behaviors and actions which bring the basis for effective SRL.

Session O 18

25 August 2021 17:30 - 18:30

Session Room 15

Invited Symposium

SIG 22: Genes, brain, and social contexts: their interactions and implications for education

Keywords: Cognitive Development, Cognitive Skills, Developmental Processes, Educational Attainment, Interdisciplinary, Language (L1/Standard Language), Neuroscience, Numeracy, Social Development, Social Interaction

Interest group: SIG 22 - Neuroscience and Education

Chairperson: Stephan Vogel, University of Graz, Austria

Discussant: Jessica Massonié, United Kingdom

The development of the human brain constitutes an active, dynamic and complex interaction between a person's biological predispositions (e.g., genes), cognitive and non-cognitive abilities (e.g., motivation, curiosity), and social environments (e.g., socioeconomic status, SES). These interactions and their implications for learning and instruction will be discussed by international experts in the present SIG-22 invited symposium. The first two talks focus on specific language and numeracy skills. Chiara Cantiana shows that both SES and electroencephalographic (EEG) auditory processing markers relate to the developmental trajectory of toddlers' expressive vocabulary. Ece Demir-Lira highlights interactions between social contexts and brain processing by examining how the neurocognitive basis of numerical processing varies as a function of parent-child numeracy interactions. The last two talks look at older participants and their educational achievement. Perline Demange shows that both cognitive and non-cognitive abilities contribute to educational achievement and involve the same type of cells in the brain. Their genetic underpinning correlate with important SES outcomes. Nicholas Judd highlights that, whereas genetic markers for educational achievement and SES are correlated, they both independently relate to adolescents' cortical surface area and working memory. This series of talks raises the question of how best to conceive the interactions between genetic, brain level, and environmental data to understand cognition and educational performance. In Panelists and participants will be invited to discuss how these different levels of understanding can inform learning and instruction, in a discussion facilitated by Jessica Massonié.

Brain-based markers and socioeconomic status relate to expressive vocabulary development

Presenting Author:Chiara Cantiana, IRCCS Eugenio Medea, Italy

In the present study, we are investigating trajectories of expressive vocabulary in a sample of Italian toddlers and we are exploring the role that early brain-based markers (e.g., ERP measures of Rapid Auditory Processing [RAP] and/or environmental factors (socioeconomic status [SES]) might have in the delineation of such developmental trajectories. Expressive vocabulary was assessed in 100 typically developing toddlers at three time-points between 20 and 36 months of age and was modelled using growth mixture analysis to identify distinct classes of children based on language scores. Then, we associated class membership with ERP measures of RAP at 6 months of age and SES. Latent-class growth analysis identified 3 classes: Stable Language Delay (SLD, 18%), Typical Language development (TL, 33%) and late-onset TL (49%). ERP measures of RAP have been found to differentiate between TL and both SLD and late-onset TL (conditions of early risk for language delay), whereas SES differentiated between SLD vs. late-onset TL. These findings have important implications for education, suggesting on the one side the potential role of early interventions finalized to the empowerment of infants' neuronal and electrophysiological functioning underlying RAP, and on the other side the need of interventions promoting environmental enrichment and caregiver training to support the development of language, especially for those children who are at early risk for language delay.

Relations of parent-child number-related interactions to brain measures of number processing

Presenting Author:O. Ece Demir-Lira, University of Iowa, United States

Children vary in their numerical processing starting from very early on. Some children fall behind their peers in their numerical knowledge even before formal schooling starts, which implicates the role of the home environment. The neurocognitive mechanisms that mediate the relations between children's early experiences in the home and their numerical performance remain underspecified. The current project aims to pinpoint the neurocognitive and experiential mechanisms of individual differences in basic numerical processing in 4 to 5-year-olds. Using functional near-infrared spectroscopy (fNIRS), we ask whether children recruit similar or different systems in the brain for non-symbolic and symbolic number processing as a function of their early experiences. We specifically examine relations of brain activation patterns and behavioral performance during number processing to parent-child interactions around numbers (number-related language input and activities). Better understanding the relations between home environment and the neurocognitive basis of numerical processing will inform future interventions that capitalize on children most critical resource during early childhood — their parents.

Investigating the genetic architecture of noncognitive skills using GWAS-by-subtraction

Presenting Author:Perline Demange, Vrije Universiteit Amsterdam, Netherlands

Little is known about the genetic architecture of traits affecting educational attainment other than cognitive ability. We used genomic structural equation modeling and prior genome-wide association studies (GWASs) of educational attainment ($n = 1,131,881$) and cognitive test performance ($n = 257,841$) to estimate SNP associations with educational attainment variation that is independent of cognitive ability. We identified 157 genome-wide-significant loci and a polygenic architecture accounting for 57% of genetic variance in educational attainment. Noncognitive genetics were enriched in the same brain tissues and cell types as cognitive performance, but showed different associations with gray-matter brain volumes. Noncognitive genetics were further distinguished by associations with personality traits, less risky behavior and increased risk for certain psychiatric disorders. For socioeconomic success and longevity, noncognitive and cognitive-performance genetics demonstrated associations of similar magnitude. By conducting a GWAS of a phenotype that was not directly measured, we not only offer

a view of the genetic architecture of noncognitive skills influencing educational success, but also a new tool to further study their importance in education and interplay with the parental, school and social context.

SES and genetic markers of educational attainment both influence neurocognitive development

Presenting Author:Nicholas Judd, Karolinska Institute, Sweden

Genetic factors and socioeconomic (SES) inequalities play a large role in educational attainment, and both have been associated with variations in brain structure and cognition. However, genetics and SES are correlated, and no prior study has assessed their neural effects independently. Here we used polygenic scores for educational attainment (EduYears-PGS) as well as SES, in a longitudinal study of 551 adolescents, to tease apart genetic and environmental effects on brain development and cognition. Subjects received a structural MRI scan at ages 14 and 19. At both time-points, they performed three working memory (WM) tasks. SES and EduYears-PGS were correlated ($r = 0.27$) and had both common and independent effects on brain structure and cognition. Specifically, lower SES was related to less total cortical surface area and lower WM. EduYears-PGS was also related to total cortical surface area, but in addition had a regional effect on surface area in the right parietal lobe, a region related to nonverbal cognitive functions, including mathematics, problem solving and WM. SES, but not EduYears-PGS, affected the change in total cortical surface area from age 14 to 19. This is the first study demonstrating the regional effects of EduYears-PGS and the independent role of SES on cognitive function and brain development. It suggests that the SES effects are substantial, affect global aspects of cortical development, and exert a persistent influence on brain development during adolescence.

Session P 1

25 August 2021 18:45 - 19:45

Session Room 18

Single Paper

Teaching and Teacher Education

Argumentation and Teacher Professional Development

Keywords: Argumentation, In-service Teacher Education, Learning Approaches, Qualitative Methods, Self-efficacy, Teacher Professional Development, Workplace Learning

Interest group: SIG 11 - Teaching and Teacher Education, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Alaric Kohler, HEP-BEJUNE, Switzerland

The role of teacher professionalism in changing dialogic and argumentative practices

Keywords: Argumentation, Self-efficacy, Teacher Professional Development, Workplace Learning

Presenting Author:Christiana Karousiou, University of Nicosia, Cyprus; **Presenting Author:**Maria Evagorou, University of Nicosia, Cyprus; **Co-Author:**Maria Vrikki, University of Cyprus, Cyprus

This paper examines the role of professionalism in teachers' change in practice related to dialogue and argumentation. Data were collected from 20 pre-primary and primary school teachers who participated in a professional development program with an emphasis on promoting values such as tolerance, empathy, inclusion and social responsibility through dialogue and argumentation. Data from teachers' transcribed lessons revealed discrepancies in teachers' implementation of the lesson plans, despite receiving the same professional support. This paper argues that the discrepancies lie in the notion of professionalism, accounting for teacher agency, self-efficacy and autonomy. Three positions on the professionalism continuum were identified from this implementation: the *prescriber*, the *implementer* and the *enactor*. Interview data examining teacher professionalism traits confirmed these positions. The paper aims to contribute to the literature on professionalism, as the latter re-emerges as a key concept in recent teacher professional development literature.

Teacher's argumentative lesson plan in two professional development programs: a qualitative study

Keywords: Argumentation, In-service Teacher Education, Qualitative Methods, Teacher Professional Development

Presenting Author:Gabriel Fortes, Universidad Alberto Hurtado, Chile; **Co-Author:**Marisol Gómez, Universidad Alberto Hurtado, Chile; **Co-Author:**Joaquin Grez, Universidad Alberto Hurtado, Chile; **Co-Author:**Antonia Larraín, Universidad Alberto Hurtado, Chile

While argumentation is a crucial feature for the future of education, we have only seen few changes in this direction. One possible solution to this is through teacher professional development on pedagogical content knowledge of argumentation. However, less is known about what should be focused on teacher education in argumentation; although it is assumed that pedagogical knowledge is crucial, argumentation is a conceptual challenging subject. We propose two different argumentative TDPs (32h each) to two different groups of in-service teachers: one aimed to foster argumentative teaching skills, the other to improve teacher's conceptual knowledge of argumentation. In the present work, we present the qualitative comparison of the pre-post intervention of teacher's lesson plan construction. We sought to understand how these courses would impact teachers' classroom activities' design capacity, a key skill to understand argumentation's pedagogical knowledge. 40 Chilean in-service teachers that voluntarily subscribed to the two TDPs. The first group was 19 (16 female) and the second 21 (15 female) teachers from different disciplines. Through thematic discourse analysis, we observed that teachers in both groups improved their capacity to design argumentative lesson plans and to set argumentative goals. However, the groups differed in the strategies and focus of argumentation. While the first group focused on designing for disagreement of opinion as a learning tool, the second focused on argument structure for production and evaluation. Our findings shed light on the discussion on what knowledge is required to create an argumentative classroom environment.

An investigation of teacher professional learning that resulted in significant shifts in practice

Keywords: Argumentation, In-service Teacher Education, Learning Approaches, Teacher Professional Development

Presenting Author:Matthew Wilsey, Stanford University, United States; **Co-Author:**Coralie Delhayé, Stanford University, United States; **Co-Author:**Jonathan Osborne, Stanford University, United States; **Co-Author:**Hilda Borko, Stanford University, United States; **Co-Author:**Emily Reigh, Stanford University, United States

In collaboration with three educational partners, we designed a program of professional learning (PL) to support elementary teachers' implementation of scientific argumentation. At the conclusion of the first year of our four-year project, we observed significant improvements in teachers' classroom argumentation practices. This paper investigates the particular PL features and interactions that may have contributed to changing the teachers' knowledge and practice during the first year of the PL. Drawing upon PL artifacts, both from the design and from the implementation, as well as from video and audio recordings, we found that there were patterns in how and when specific knowledge bases or pedagogies were emphasized during the PL. During the initial Summer Institute, there was a more equal emphasis on content knowledge (CK), pedagogical knowledge (PK), and pedagogical content knowledge (PCK) through activities that used a pedagogy of investigation. There was a shift, however, during follow-up days in the academic year, when there was a greater focus on PCK and supporting teachers' enactment of argumentation. Although teachers' perceptions generally aligned with our analysis of the PL design and implementation, many teachers did not report changes to their conceptual understanding of science topics (CK). As more nuanced insights about the feature of effective PL are needed, our initial results support literature that calls practice-based PL that is embedded in the specifics of teaching. Furthermore, our study suggests how pedagogies of investigation and enactment can be leveraged to shift teachers' knowledge and practice.

Session P 2

25 August 2021 18:45 - 19:45

Session Room 5

Single Paper

Lifelong Learning

Social Interaction in Informal, Lifelong and Collaborative Learning

Keywords: Cooperative/Collaborative Learning, Informal Learning, Lifelong Learning, Social Interaction

Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Karsten Wutschka, Germany

Gaining insight into one's own and experts' knowledge by explaining: an experimental study

Keywords: Cooperative/Collaborative Learning, Informal Learning, Lifelong Learning, Social Interaction

Presenting Author:Nina Vaupotič, University of Münster, Germany; **Co-Author:**Dorothe Kienhues, University of Münster, Germany; **Co-Author:**Regina Jucks, WWU Münster, Germany

In a number of previous studies, it was shown that people can gain a more realistic insight into their own (lack of) knowledge after providing an explanation of a phenomenon to another person. This may be useful in a complex world, in which distinguishing one's general knowledge from detailed scientific knowledge is not an easy task (Rabb, Fernbach, and Sloman, 2019), and feelings of overconfidence may arise due to the simple language, in which scientific information is presented (Scharrer et al., 2019). We investigated how participants ($N = 155$) perceived their own and experts' knowledge about a scientific topic before and after engagement with an online science article in one of the two ways: reading or reading and explaining. Participants dealt with the topic of predicting weather events based on artificial intelligence. After engagement with the science article, knowledge ratings in the explanation group were not significantly different from the knowledge ratings in the reading group. In both groups, the ratings of participants' own knowledge were significantly lower than the ratings of scientists' knowledge ($p < .001$, $\eta^2 = .36$). The explanation group also reported a significantly higher reliance on their own capabilities for dealing with the scientific topic ($p = .03$, $\eta^2 = 0.03$). Results are discussed in light of the qualitative content analysis of provided explanation, which were written in a summarizing and simplified manner, as well as from the perspective of people's epistemic dependence on experts in our community of knowledge.

Facts don't speak for themselves: Discussing evidence about Covid-19 in three Reddit communities

Keywords: Cooperative/Collaborative Learning, Informal Learning, Lifelong Learning, Social Interaction

Presenting Author:Mark Felton, San Jose State University, United States; **Co-Author:**Ellen Middaugh, San Jose State University, United States; **Co-Author:**Henry Fan, San Jose State University, United States

As the Covid-19 pandemic has shown, key sources of scientific information and health recommendations have come under attack in the press, and particularly on social media. However, overgeneralizations about the quality of discourse on social media run the risk of neglecting importation variations within and between platforms. The present study examines the use, sourcing and evaluation of evidence in dialogues about Covid-19 in three Reddit communities, each with unique rules and norms. Our aim is to characterize dialogue about scientific evidence in each setting in light of the affordances and constraints set by each community's norms. We present samples of dialogue to illustrate key trends and conclude with a discussion of the implications of these findings for educators interested in fostering critical dialogue about evidence among youth in online settings.

Teachers' collaborative argumentation when reasoning the selection of online educational information

Keywords: Cooperative/Collaborative Learning, Informal Learning, Lifelong Learning, Social Interaction

Presenting Author:Maria Zimmermann, Humboldt University of Berlin, Germany; **Co-Author:**Elisabeth Mayweg, Humboldt University of Berlin, Germany

(Future) teachers must acquire skills in sourcing science-related information from the Internet for using evidence appropriately in their pedagogical practice. To successfully use such evidence, it is vital that teachers critically question their selection of online information. Based on findings from collaborative learning, we hypothesized that collaboration promotes teachers' critical questioning of their selection of online information. In a 2x2 between-design study—with the between factor *individual vs. collaborative reasoning* and the within factor *pre vs. post self-reported information seeking self-efficacy*—each of $N = 83$ future teachers individually sought online information on the educational use of mobile phones in classrooms. This constituted a realistic search on the Internet, in a natural setting. Based on each participant's particular search, s/he was asked to select the online sources that s/he perceived relevant for justifying whether mobile phones should be used in class. To foster reflection on how they selected information, participants were asked to either reason individually (*individual group*, $n = 33$) or chat collaboratively (*collaboration group*, $n = 50$ in 25 dyads) about their selections. Participants in both groups reported higher information seeking self-efficacy after the reasoning task. Yet, participants who collaboratively reflected on their selections more frequently showed elaborated reasoning behavior than did participants in the individual group. Considering the potential benefits and challenges of collaboration, we discuss the findings in terms of how to promote future teachers' ability to critically reflect on their selection of online educational information.

Session P 3

25 August 2021 18:45 - 19:45

Session Room 10

Single Paper

Cognitive Science, Instructional Design

Mathematics and Secondary Education

Keywords: Conceptual Change, Educational Psychology, Instructional Design, Mathematics, Misconceptions, Problem Solving, Secondary Education

Interest group: SIG 03 - Conceptual Change, SIG 06 - Instructional Design

Chairperson: Anna Serbati, University of Padova, Italy

NNB in understanding the concept of variable - the role of integrity and the phenomenal sign bias

Keywords: Conceptual Change, Educational Psychology, Mathematics, Secondary Education

Presenting Author:Konstantinos Christou, University of Western Macedonia, Greece; **Co-Author:**Despoina-Ioanna Kyrvei, University of Western Macedonia, Greece

Variables are literal symbols that stand for any number. However, prior research has shown that due to a natural number bias students tend to misinterpret variables to stand primarily for natural numbers. Natural number bias is the phenomenon of students using their prior knowledge of numbers – which is organized in a coherent body of knowledge with numbers having the properties of natural numbers – in situations where this knowledge does not apply. Due to this bias, students tend to think that variables stand primarily for natural numbers (i.e. that $k+3$ stands for 3, 6, etc.) and they also tend to think that the sign an algebraic expression appears to have (i.e. its phenomenal sign) is the sign of the values it may only represent (i.e. that $-b$ only stands for $-2, -3$ etc.). This report aims to present quantitative results from a study where students were asked to evaluate a series of statements about the numerical value of algebraic expressions. 138 8th and 9th graders were given a questionnaire with 48 statements about numbers that can or cannot be assigned to six algebraic expressions that contained literal symbols. The results showed that the students tended to agree with statements which were in line with their intuition that variables stand for whole numbers (integrity effect) and not for rational numbers, and that algebraic expressions stand for numbers of the same sign as the expressions' phenomenal sign (phenomenal sign effect). It also appeared that the integrity effect was stronger than the phenomenal sign effect.

Long-term effects of biased distributions of rational number tasks in mathematics textbooks

Keywords: Instructional Design, Mathematics, Misconceptions, Secondary Education

Presenting Author:Parvaneh Babari, Pädagogische Hochschule Schwyz, Switzerland; **Co-Author:**Andrea Cantieni, Schwyz University of Teacher Education (Pädagogische Hochschule Schwyz), Switzerland; **Co-Author:**Lennart Schalk, PH Schwyz, Switzerland

Abstract Understanding and doing calculations with rational numbers (e.g., fractions, decimals) is highly challenging for students and even adults. Braithwaite and Siegler (2018) sought for explanations of these problems and investigated middle school students' choices of solution strategies for solving arithmetic tasks with fractions in both the United States and China. They found that children relied strongly on mathematically irrelevant associations between fraction arithmetic operations and operand features they learn from biased distributions of tasks in their mathematics textbooks. Babari and Schalk (2019) replicated and extended

these observations by analysing the two most widely used primary school mathematics textbooks series for 5th and 6th grade in the German-speaking part of Switzerland. Their analysis indicated that, for fractions and for decimals, both textbook series showed biased distributions, and the bias was even more pronounced in one of the series. In the present study, we re-analyzed data from a large-scale national assessment of mathematics performance of 9th graders in Switzerland. We checked whether the different strengths of the bias in the two textbooks can explain specific patterns of correct and incorrect solutions in particular tasks. The results indicate that a stronger bias is indeed related to more incorrect solutions. Thus, biased distributions of rational number tasks in primary school textbooks have a detrimental long-term effect.

Computer-based PS-I: Adaptive fitting of own and foreign errors during focused error processing

Keywords: Conceptual Change, Mathematics, Problem Solving, Secondary Education

Presenting Author: Antje Boomgaarden, University of Education Freiburg, Germany; **Co-Author:** Katharina Loibl, University of Education Freiburg, Germany; **Co-Author:** Timo Leuders, University of Education Freiburg, Germany

In the context of instructional models with an initial problem-solving phase followed by an instructional phase, the student solutions generated in the problem-solving phase represent only partial steps on the way to the target concept. Both, theoretical assumptions on the mechanism of conceptual change as well as empirical findings on instructional formats that are effective in learning by using (erroneous) partial solutions, suggest that it is important to pick up erroneous student solutions in the instructional phase by comparing the erroneous and the correct solution. There is initial evidence that the greatest learning success is seen when the incorrect solution reflects the individual understanding from the problem-solving phase. In our study, we investigated in a controlled way which role the fit between the individual solution type and the solution type in the instructional phase plays for learning success. In a computer-based learning environment, sixth-graders worked on a problem-solving task to compare fractions. In the subsequent, also computer-based instruction phase, students in the different conditions were given 1) an adaptive comparison, 2) a contra-adaptive comparison, 3) only the correct solution.

Session P 4

25 August 2021 18:45 - 19:45

Session Room 3

Single Paper

Learning and Instructional Technology, Learning and Social Interaction

E-Learning and Online Learning

Keywords: Attitudes and Beliefs, E-Learning/Online Learning, Educational Technology, Higher Education, Learning Technologies, Quantitative Methods, Student Learning

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Suzanne Splinter, Katholieke Universiteit Leuven, Belgium

Exploring factors for experts' response rate on an educational Community Question-Answering platform

Keywords: E-Learning/Online Learning, Educational Technology, Learning Technologies, Quantitative Methods

Presenting Author: Harry Stokhof, HAN University of Applied Sciences, Netherlands; **Co-Author:** Kalliopi Meli, University of Patras, Greece; **Co-Author:** Konstantinos Lavidas, University of Patras, Greece

In order to consider learners "active" in any learning community (formal or informal) one important criterion is their positive attitude and action toward questioning. Learners' questions are an objective of educational research because they usually reflect a spirit of inquiry that sets the foundation for many 21st-century skills. However, until now, questions have mainly been investigated within traditional educational contexts, such as the school classroom, where all pertinent interactions take place only between teachers and students. Yet, the last decade has brought the substantial development of Community Question-Answering (CQA) platforms online, hosting significant numbers of experts who appear willing to respond to questions, too - including learners' subject-specific questions. In spite of vast expert participation on such platforms, overall response rates are rather low, and a noteworthy percentage of learners' questions remain unanswered. The aim of this research is to explore the factors that influence whether participating experts answer or dismiss a question they have encountered on an educational CQA platform. As a case study, we used "100mentors," a platform/mobile app that specifically focuses on young learners' questions. Our results indicate that a CQA platform's functionality and responding experts' intrinsic motives are prevailing factors that influence the response rate. We posit that these factors can also work as indicators for learners in effective question formulation that attracts one or more answers.

Between acculturation and self-determination: a study at the Ecole Hôtelière de Lausanne

Keywords: E-Learning/Online Learning, Higher Education, Quantitative Methods, Student Learning

Presenting Author: Charlotte de Boer, Université de Genève, Switzerland; **Co-Author:** Nathalie DELOBBE, University of Geneva, Switzerland; **Co-Author:** Sébastien Fernandez, Ecole Hôtelière de Lausanne, Switzerland

This study analyzes the mechanisms by which students entering the Ecole Hôtelière de Lausanne (EHL) socialize in this institutional context. We more precisely examine if proactive socialization behaviors could be used by newcomers when they wish to express themselves in authentic or inauthentic ways. We theorize that proactive socialization behaviors mediate the positive relationship between self-expression and affective commitment and satisfaction, and that proactive socialization behaviors mediate the negative relationship between facades of conformity and affective commitment and satisfaction. We will also compare pre-covid and covid generations and question if the health measures implemented at EHL in 2020 have an effect on the process of organizational socialization of the students. The results show an indirect effect of self-expression on affective commitment and satisfaction, through the mediation of proactive socialization behaviors. The effect of facades of conformity on affective commitment and satisfaction is mediated by proactive socialization behaviors. The results of this research can provide elements of answers for institutions that would like to improve the socialization process towards their new students. Institutions that wish to integrate and retain their students should probably pay particular attention to self-expression, facades of conformity and proactive behaviors.

Language Teachers' Instructional Use of Technology in the COVID-19 Era

Keywords: Attitudes and Beliefs, E-Learning/Online Learning, Educational Technology, Quantitative Methods

Presenting Author: Wai Ming Cheung, The University of Hong Kong, Hong Kong; **Co-Author:** Fai Mei WONG, Baptist Lui Ming Choi Primary School, Hong Kong, Hong Kong; **Co-Author:** Serene Chan, The University of Hong Kong, Hong Kong

Information and computer technology (ICT) plays a significant role in supporting learning and teaching especially during the global pandemic of COVID-19. Drawing on Davis' widely used Technology Acceptance Model (TAM), this study aims to discover the predictors of teachers' technology use by including the constructs of creativity perception and pedagogical beliefs. One hundred and five Chinese and English language teachers in Hong Kong from 30 primary schools participated in an online questionnaire survey. Path analysis showed that the creativity perception of language teachers positively influenced their constructivist pedagogical belief, perceived usefulness, and attitudes toward ICT use for language teaching. The findings shed light on the new normal of teaching practices and engagement with technology during the COVID-19 era.

Session P 5

25 August 2021 18:45 - 19:45

Session Room 6

Single Paper

Instructional Design

Writing and Literacy in Primary and Secondary Education

Keywords: Cognitive Skills, Instructional Design, Language (L1/Standard Language), Secondary Education, Technology, Writing/Literacy

Interest group: SIG 12 - Writing

Chairperson: Martijn Meeter, Vrije Universiteit Amsterdam, Netherlands

An intervention study of writing in Technical Education at lower secondary school

Keywords: Instructional Design, Secondary Education, Technology, Writing/Literacy

Presenting Author:Johan van Driel, University of Amsterdam, Netherlands

Modern technology education and the necessity of the use of written language in the teaching subject, require a language-forming teaching concept for learning technical language and linguistic actions in the context of the subject itself. In order to achieve the goal of language teaching in technology education classes, a quasi-experimental field study on the effectiveness of text type-based language training in grade seven and eight is being carried out in the BMBF project SchriFT II[1]. The project investigates the interrelation between subject-based skills like descriptions and explanations and writing skills. The main assumption is that through the production of domain specific types of text (here: technical analysis of technical systems) the epistemic function of language is developed, and students' academic language ability strengthened as well as their subject related competences. Therefore, an intervention study of app. 840 minutes of teaching in technical education classes is implemented. In school reality students and teachers are not used to writing or writing instructions, which makes it more important to find ways to support students writing abilities and strengthen teachers' competencies in planning and organizing domain specific writing instructions. Hallet (2013) adapted the Genre Cycle in Germany and specified it as relevant for writing in content subjects.

[1] SchriFT II = Writing skills in lower secondary school and the involvement of Turkish – An empirical study on the effects of promoting writing skills in subject lessons and in the heritage language Turkish).

Secondary school students' cognitive processes while writing-from-sources in history and philosophy

Keywords: Cognitive Skills, Language (L1/Standard Language), Secondary Education, Writing/Literacy

Presenting Author:Lieke Holdinga, University of Amsterdam, Netherlands; **Co-Author:**Tanja Janssen, Universiteit van Amsterdam, Netherlands; **Co-Author:**Gert Rijlaarsdam, University of Amsterdam, Netherlands

Performing writing tasks is a regular activity for secondary school students, especially in linguistically demanding disciplines such as history and philosophy. Traditionally, language teachers are responsible for students' writing skill development. However, by keeping this education in the language classroom, discipline-specificity is neglected. As a consequence, a problem arises: there is only limited transfer, although this aspect is crucial for successful writing in the disciplines. To close this gap, we need to design discipline-specific writing instructions that promote transfer from general writing to discipline-specific writing. As a first step, we felt the need to explore which cognitive activities during the writing-from-sources process are crucial for successful disciplinary writing. This was the aim of our present study. We conducted a think-aloud study with 15 students (11th grade) performing writing-from-sources tasks, one for each discipline. From the overall data, nine activities were derived, which were analyzed on relative and absolute duration, and on frequency and moment of occurrence. Furthermore, we assessed the quality of students' thinking processes and texts. Results showed that the disciplines required different approaches. For philosophy, the writing process was dominant and influencing both text and thinking; philosophical thinking and writing were intertwined processes. For history, the planning process seemed to be most important, compared to other process activities, yet only influencing text quality and not thinking process quality; historical thinking and writing thus appeared to be separate processes. We will discuss what these findings mean for the design of strategy-instruction for better writing, adapted to discipline-specific demands.

Session P 6

25 August 2021 18:45 - 19:45

Session Room 17

Single Paper

Cognitive Science, Higher Education

Cognitive Development

Keywords: Cognitive Development, Cognitive Skills, Educational Psychology, Higher Education, Mixed-method Research, Primary Education, Professions and Applied Sciences, Quantitative Methods, Quasi-experimental Research

Interest group: SIG 04 - Higher Education, SIG 27 - Online Measures of Learning Processes

Chairperson: Emily Grossnickle Peterson, United States

Music Professional Training Fosters Inhibitory Oculomotor Control: Longitudinal eye tracking study

Keywords: Cognitive Development, Educational Psychology, Primary Education, Quasi-experimental Research

Presenting Author:Krzysztof Krejtz, SWPS University of Social Sciences and Humanities, Poland; **Co-Author:**Agata Rodziewicz, SWPS University of Social Sciences and Humanities, Poland; **Co-Author:**Andrew Duchowski, School of Computing, Clemson University, United States; **Co-Author:**Izabela Krejtz, SWPS University of Social Sciences and Humanities, Poland

The present study examined how music education exert on development of attentional control. Eighty primary school children (from music and general schools) performed an antisaccade task while their eye movements were recorded. We monitored the children attentional control over three years of their school education. The presented results triangulates the behavioral and attentional levels of data. Over the time, we observed much faster growth of the inhibitory control ability in the music school children than in the general school group. In the antisaccade task, their correct responses time was significantly faster and faster and the decrease was significantly greater in children from music schools than in those from non-music schools. Eye tracking revealed that linear decrease of correct response time in music school children is yielded by shorter latency of the saccade towards the target. This is the first longitudinal eye tracking study demonstrated the potential of systematic music education for the development of children's attentional control. The results are discussed in the relation to the current neuropsychological literature on attentional control. As a practical conclusion we postulate that systematic music training as an effective tool to yield attentional control, should be introduced at relatively early stages of education.

Visual expertise in ECG interpretation: an eye-tracking augmented re situ interview approach

Keywords: Cognitive Development, Higher Education, Mixed-method Research, Professions and Applied Sciences

Presenting Author:William Wu, Queen's University, Canada; **Co-Author:**Andrew Hall, Queen's University, Canada; **Co-Author:**Heather Braund, Queen's University, Canada; **Co-Author:**Colin Bell, Queen's University, Canada; **Co-Author:**Adam Szulewski, Queen's University, Canada

Visual expertise in medicine involves a complex interplay between expert visual behaviour patterns and higher-level cognitive processes. One example lies within electrocardiogram (ECG) interpretation, a common clinical task associated with high error rates among trainees. This qualitatively driven multi-methods study aimed to describe differences in cognitive approaches to ECG interpretation between Canadian medical students, emergency medicine (EM) residents, and EM attending physicians. Participants interpreted 10 ECGs with a screen-based eye-tracking device, then underwent a re situ interview augmented by playback of participants' own gaze scan-paths via eye-tracking. An emergent thematic analysis was performed on all interview transcripts and compared between participant groups. Diagnostic speed, accuracy, and heat maps of fixation distribution were collected to supplement the qualitative findings. Qualitative analysis demonstrated differences among the cohorts in three major themes: dual-process reasoning, ability to prioritize, and clinical implications. These qualitative findings were aligned with differences in visual behaviour demonstrated by heat maps of fixation distribution across each ECG. More experienced participants completed ECG interpretation significantly faster and more accurately than less experienced participants. Using eye-tracking to understand how experienced clinicians look and think about ECGs may help inform best practices in teaching this ubiquitous skill. The themes derived from this study may be particularly helpful in guiding coaching interventions focused on developing visual expertise after the fundamentals of ECG interpretation have been mastered. Eye-tracking as an assessment tool may also provide more holistic insight into a learner's ECG interpretation ability, identify specific areas of weakness, and produce more tailored feedback.

Acute physical activity and cognition. An intraindividual study of primary school children.

Keywords: Cognitive Development, Cognitive Skills, Primary Education, Quantitative Methods

Presenting Author:Lars-Erik Malmberg, University of Oxford, United Kingdom; **Co-Author:**Christina Heemskerk, University of Bern, Switzerland; **Co-Author:**Henry Lo, University of Surrey, United Kingdom; **Co-Author:**Patrick Esser, Oxford Brookes University, United Kingdom; **Co-Author:**helen dawes, Oxford Brookes University, United Kingdom; **Co-Author:**Stefan Kodzhabashev, University of Bern, Switzerland; **Co-Author:**Claudia Roebers, University of Bern, Switzerland

Background: There is a blooming interest in understanding learning processes using intraindividual data in educational research. In the Physical Activity, Engagement and Cognition (PEC) study we go beyond previous intraindividual studies by including two objective measures (accelerometer wristbands and tablet based Hearts and Flowers executive functioning tasks), and investigated individual differences in associations between physical activity (PA), sleep and situation-specific cognition, and whether child characteristics (gender, age, overall PA) would moderate association between cognition and PA. Sample: Forty-six children in Years 4-6 in primary school ($M_{\text{Age}} = 9.9$, $SD = 0.73$, 24 (52.2%) girls) took part in the study. Method: Children wore an Axivity accelerometer wristband throughout the study, which lasted two calendar weeks ($n = 46$ children, $M_{\text{days}} = 8.8$, $SD = 3.3$, Range 2-14). Using Tablets, they carried out an executive functioning task twice daily (morning and afternoon, $n = 46$ children, $M_{\text{EF}} = 14.2$, $SD = 5.2$, Range = 2-20). Results: We found individual differences (slope variances) in the associations between PA and cognition, but child characteristics did not moderate the associations. Children who were more vigorously active during the day had longer sleep duration during the subsequent night. Sleep duration in turn positively related to shorter reaction times on the hearts and flowers task. Conclusions: PA was associated with sleep duration, which was related with shorter response times. Future studies are needed for further exploration of indirect effects and moderators.

Session P 7

25 August 2021 18:45 - 19:45

Session Room 16

Single Paper

Higher Education, Instructional Design

Teaching Approaches

Keywords: Environmental Education, Higher Education, Instructional Design, Pre-service Teacher Education, Teaching Approaches, Teaching/Instruction, Video Analysis

Interest group: SIG 06 - Instructional Design, SIG 11 - Teaching and Teacher Education

Chairperson: Theresa Wilkes, Saarland University, Germany

Teacher questions and student responses in case-based learning: A video study in medical education

Keywords: Higher Education, Teaching Approaches, Teaching/Instruction, Video Analysis

Presenting Author:Martin Gartmeier, Technical University of Munich (TUM), Germany; **Co-Author:**Alexander Hapfelmeier, Technical University of Munich (TUM), Germany; **Co-Author:**Marc Gruenewald, Technical University Munich, Germany; **Co-Author:**Janina Häusler, Technische Universität München (TUM), Germany; **Co-Author:**Theresa Pfurtscheller, Technical University of Munich (TUM), Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany; **Co-Author:**Pascal Berberat, Technische Universität München (TUM), Germany

Case based learning (CBL) is a very interactive teaching format widely used in medical education. However, little is known about how teachers and learners interact in this CBL. For this reason, we conducted a video study on case based seminars from the domains of internal medicine and surgery. Our research question is how the type of questions asked by clinical teachers predicts reproductive / elaborative responses by students in CBL medical education. We videotaped 32 clinical seminars taught by 21 medical teachers attended by 16 students, on average. We applied a theory based, low inference coding scheme with good reliability. For data analysis, we used the evolutionary trees method. As can be expected from theory, reproductive teacher questions triggered very few elaborative student responses. In contrast, elaboration/deep reasoning questions were related to high elaboration by students. We found elaboration/deep-reasoning questions by clinical teachers to be the most important trigger for elaborative answers, whereby a differential effect between internal medicine and surgery was apparent. These outcomes provide an interesting perspective on the format of CBL, showing that this format is characterized by a balance between reproduction and elaboration on the side of students.

Teachers' Interests & Instructional practices in Action in Education for Sustainable Development

Keywords: Environmental Education, Instructional Design, Teaching Approaches, Teaching/Instruction

Presenting Author:Eleni Sinakou, University of Antwerp, Belgium; **Co-Author:**Vincent Donche, University of Antwerp, Belgium; **Co-Author:**Peter Van Petegem, University of Antwerp, Belgium

Instructional practices regarding action-orientation in Education for Sustainable Development are thought to play a crucial role in the cultivation of students' action competence towards Sustainable Development issues. This paper explores teachers' interests and their self-reported action- oriented ESD instructional practices. The instrument employs a survey vignette methodology consisting of vignettes describing different instructional practices in an integrated way. The study revealed that teachers have a poor understanding of action- orientation in ESD. Reported interests and instructional practices depend greatly on each vignette. As a response to the vignette which describes with low action- oriented ESD instructional practices, the teachers mention that they take into account several perspectives, while they are interested in Community involvement practices. However, as a response to the vignette which describes with high action-oriented ESD instructional practices, some teachers report that they apply Action-taking practices, while they are interested in combining Community involvement practices with Action-taking practices. The findings of the study have implications for ESD research and practice.

Fading solution steps and revealing the solution when modelling skills

Keywords: Instructional Design, Pre-service Teacher Education, Teaching Approaches, Teaching/Instruction

Presenting Author:Katharina Engelmann, Universität Hildesheim, Germany; **Co-Author:**Corinna Behrendt, Universität Hildesheim, Germany; **Co-Author:**Christof Wecker, Universität Hildesheim, Germany

Watching others demonstrate a skill is often how we learn to perform the skill ourselves. There is little research on skill acquisition with demonstrations and how learning from demonstrations can be fostered. However, we can transfer findings from research on worked examples. We investigated to what extent the *fading* of solution steps and the *revealing* of the remaining solution steps influence the skill acquisition in learning from demonstrations. A 2x2 experimental study with the factors *fading* of solution steps and *revealing* of the remaining solution steps was conducted. University students learned to calculate Cohen's Kappa from video demonstrations. Results show that *fading* has a positive effect on students' skill acquisition. An effect *revealing* of the remaining solution steps was not found. The positive effect of fading on skill acquisition is coherent with results from research on worked examples, supporting our hypothesis that learning from demonstrations is a type of example based-learning and based on similar mechanisms.

Session P 8

25 August 2021 18:45 - 19:45

Session Room 8

Single Paper

Assessment and Evaluation, Culture, Morality, Religion and Education, Learning and Special Education

Assessment and Evaluation

Keywords: Assessment Methods and Tools, Attitudes and Beliefs, Competencies, Cultural Psychology, Educational Psychology, Mathematics, Meta-analysis, Primary Education, Quantitative Methods, Social Aspects of Learning and Teaching, Special Education

Interest group: SIG 01 - Assessment and Evaluation, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Monika Waldis, University of Applied Sciences Northwestern Switzerland, Switzerland

Student-Teacher Relationship Drawings and Student Characteristics: A Cross-Cultural Comparison

Keywords: Assessment Methods and Tools, Cultural Psychology, Educational Psychology, Social Aspects of Learning and Teaching

Presenting Author: Mengdi Chen, University of Amsterdam, Netherlands; **Co-Author:** Marjolein Zee, University of Amsterdam, Netherlands; **Co-Author:** Debora Roorda, University of Amsterdam, Netherlands

Cultural contexts have been found to influence the development of student-teacher relationships (STRs). Cultural contexts may also impact associations between student characteristics (e.g., gender, age, ethnicity) and STR quality. Previous cross-cultural studies, however, often used questionnaires to measure relationship quality, which may suffer from culturally-based nuances in translating and interpreting the items. Student-Teacher Relationship Drawings (STRDs) included less verbal statements and, hence, may ease cultural comparison of STRs and how STRs are related to student characteristics. As STRDs have not been used in cross-cultural comparisons before, the present study investigated cultural differences in elementary school students' STRD across the Netherlands (a Western, individualistic country) and China (an Eastern, collectivistic country). Furthermore, we examined cultural differences in the associations between student characteristics and STRDs. The sample included 752 third to sixth graders (48.5% boys) from the Netherlands, and 574 third to sixth graders (53.7% boys) from China. Multilevel regression analyses revealed that Chinese students' drawings scored significantly lower on most negative relationship dimensions (Emotional Distance/Isolation, Anger/Tension, Role Reversal, Global Pathology), but higher on Vulnerability than Dutch students' drawings. No cultural differences were found in the positive drawing dimensions (Pride/Happiness, Vitality/Creativity). Multiple group comparisons showed that both the negative association between Student Gender and Emotional Distance/Isolation, and between Gender and Global Pathology were stronger in the Dutch sample than in the Chinese sample. The other associations were equally strong across samples. These findings suggest that future cross-cultural studies may profit from including STRDs as an additional measure of relationship quality.

Students' self-beliefs in mathematics and the learning environment - TIMSS 2019 insights

Keywords: Attitudes and Beliefs, Competencies, Mathematics, Quantitative Methods

Presenting Author: Jelena Radisic, University of Oslo, Norway; **Co-Author:** Hege Kaarstein, Department of Teacher Education and School Research, University of Oslo, Norway

With broadening our understanding that equally important schooling outcomes are also those related to fostering positive students beliefs related to learning a subject, has strengthened the need to understand such student dispositions and whether they vary across different (national) contexts. With that in mind, in this study, we employ multiple-group analyses of similarity in latent profiles on TIMSS 2019 mathematics data for Norway, Sweden and Finland. We investigate whether similar student belief profiles can be extracted across the three countries, and if students belonging to a particular profile are situated in different learning environments. Five profiles were extracted. These include a highly-motivated group (interested, confident and value math), non-motivated group (dislike, non-confident and do not value math), the moderate group (moderate values across all three constructs), utility group (highly value math) and dislike-value group (non-confident and dislike math, but somewhat value it). Further analyses did not reveal distinctive differences across the profiles in regards to students' sense of school belonging, perception of bullying or home educational resources. Differences are recorded as to student outcomes in math, with the widest gap between highly-motivated ad non-motivated groups. The first group scores 587, compared to 436 points for the latter. Students across all the profiles report disorderly behaviour to be present in some of the lessons. Highest levels of instructional clarity in mathematics lessons are reported by the highly-motivated and dislike-value groups.

Identification of gifted and talented children through nomination practices: a systematic review

Keywords: Assessment Methods and Tools, Meta-analysis, Primary Education, Special Education

Presenting Author: Francesco Marsili, University of Perugia - Italy, Italy; **Presenting Author:** Marta Pellegrini, University of Florence, Italy

Identification of gifted and talented children may be conducted through different approaches, such as traditional methods (e.g. IQ test) or nonperformance methods (e.g. nomination). Furthermore, in recent years the most common approach in gifted identification is to use multiple criteria and sources. In this study we examined nominations as a multi-criteria and multi-prospective set of methods through which identifying students with high potentials in school through a systematic review. The purpose is to examine the accuracy of nomination practices to identify gifted students compared to other standard identification methods (e.g. IQ test, WISC, Stanford-Binet) and if different teacher nomination instruments (standardized measure vs. researcher/teacher-made measure vs. informal nomination by the teacher) moderate this relationship. This study also investigates the association between the results of different types of nomination practices (teacher, peers, parents, or self-nomination). A multilevel meta-analytic review was chosen as study design and is currently in progress. Relevant works were searched electronically through bibliographic databases, journal indexes, internet search engines and 23 studies were already included in the review. These studies are at the coding stage and a new search is onwards (early January). Findings will be presented and discussed at the conference.

Session P 9

25 August 2021 18:45 - 19:45

Session Room 12

Single Paper

Instructional Design, Learning and Instructional Technology

Computer-assisted and Multimedia Learning

Keywords: Computer-assisted Learning, Educational Technology, Instructional Design, Multimedia Learning

Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Minna Törmänen, Switzerland

Learning Robotics in Virtual Reality: Impact of Sequencing and Prompting on Learning Outcome

Keywords: Computer-assisted Learning, Educational Technology, Instructional Design, Multimedia Learning

Presenting Author: Andrea Vogt, Ulm University, Institute of Psychology and Education, Department Learning and Instruction, Germany; **Co-Author:** Franziska Babel, Ulm University, Institute of Psychology and Education, Department Human Factors, Germany; **Co-Author:** Philipp Hock, Ulm University, Institute of Psychology and Education, Department Human Factors, Germany; **Co-Author:** Martin Baumann, Ulm University, Institute of Psychology and Education, Department Human Factors, Germany; **Co-Author:** Tina Seufert, Ulm University, Germany

Virtual reality (VR) environments offer promising possibilities to design learning material. However, learning in VR does not guarantee deep processing of the learning content. Therefore, further research is needed to investigate how to turn the potential of VR learning environments into an effective deep learning approach. Prior findings from multimedia design research describe the importance of adequate sequencing of pictorial and verbal information for learning successfully. Presenting a pictorial representation (e.g. picture or animation) first eases the development of a mental model. Furthermore, activation of the learner by an elaboration prompt is described to be beneficial for cognitive learning processes in VR. So far, no prior study investigated which order of sequencing VR animation and auditory text is best. Moreover, no prior study examined the combined effects of sequencing and prompting on learning outcome in VR learning environments. We tested N=81 participants in a 2x2 between-subject design: sequence (VR animation or auditory text first) and an elaboration prompt (with or without). To measure learning outcome, we differentiated by the levels knowledge, comprehension, and application. Our results imply the beneficial effects of presenting VR animation first on the knowledge level. The elaboration prompt had a beneficial effect on the application level. We found no synergic effect of VR animation first and prompting on learning outcomes. Future studies with different learning materials are required to further investigate the

effects of appropriate sequencing and prompting to gain further insight into the underlying cognitive learning processes and mental model development when learning in VR.

Learning with augmented reality - integrating virtual instructional elements into the physical world

Keywords: Computer-assisted Learning, Educational Technology, Instructional Design, Multimedia Learning

Presenting Author:Jule Krüger, Universität Duisburg-Essen, Germany; **Co-Author:**Vera Vohwinkel, University of Duisburg-Essen, Germany; **Co-Author:**Daniel Bodemer, University of Duisburg-Essen, Germany

In augmented reality (AR), a thematic and spatial integration of virtual and physical elements can be achieved by leveraging the AR-specific features contextuality and spatiality. Due to potential information overload in AR, it is especially important to reduce cognitive processing demands of visualizations that might interfere with learning processes. This can be achieved by integrating corresponding elements in representations, thus potentially reducing a split-attention effect and following the spatial contiguity principle. Unique for AR is that elements from different realities (i.e. virtual and physical) that belong together can be presented as spatially integrated. We hypothesized that an integrated representation in an instructional AR application is less cognitively demanding and leads to better learning outcomes. We compared two groups of participants ($N = 138$) in an online study. They watched a video of someone constructing a bird in Lego Duplo with the support of an AR application which showed either integrated or isolated construction guidance. The results show that both self-rated mental demand and effort were indeed lower in the integrated condition, although a measurement of extraneous cognitive load did not support these results. Furthermore, the learning outcome was better for the integrated condition. Although we did find significant differences, the results may look different when learners not only watch a video but indeed use the application or work on a more complex construction task. This will be examined in future laboratory studies. We suggest that spatially integrating thematically corresponding virtual and physical elements can be beneficial in instructional AR applications.

Supportive Elements for Coherence Formation Increase Code Comprehension

Keywords: Computer-assisted Learning, Educational Technology, Instructional Design, Multimedia Learning

Presenting Author:Andrea Vogt, Ulm University, Institute of Psychology and Education, Department Learning and Instruction, Germany; **Co-Author:**Thomas Witte, Ulm University, Institute of Software Engineering and Programming Languages, Germany; **Co-Author:**Matthias Tichy, Ulm University, Institute of Software Engineering and Programming Languages, Germany; **Co-Author:**Tina Seufert, Ulm University, Germany

Learning to code challenges novices to deal with an unfamiliar syntax and semantic structure. A graphical 3D preview can help novices to understand the computer code. Additionally, code and preview can be linked through interactive elements that visualize corresponding elements and outline their relations. By highlighting corresponding elements in the code and the preview, mapping these representations can be eased. Bidirectional linking between the code and the preview might support to map relations and processes. Both element-to-element and relation-to-relation mapping might support learning to code and when used simultaneously might result in synergic effects. In our study, learners coded three quadcopter missions in an interactive online learning environment. This contained a visual code editor with interlocking blocks (blockly) and a 3D preview of the flight trajectory. So far, we tested $N=55$ participants in a 2x2 between-subject design. We varied the included supportive elements: highlighting (with or without), bidirectional linking (with or without). As dependent variables, we measured learning outcome on three levels (knowledge, comprehension, and application) as well as coding correctness. Our preliminary results imply that supportive elements had a significant beneficial effect on learning outcome on the comprehension level only. Coding task correctness did not differ significantly between learners with or without supportive elements. Further data collection and analysis of learners' aptitudes are required to gain further insights into the beneficial effect of highlighting and bidirectional linking for learning to code.

Session P 10

25 August 2021 18:45 - 19:45

Session Room 4

Single Paper

Learning and Instructional Technology, Motivational, Social and Affective Processes, Teaching and Teacher Education

Vocational Education

Keywords: Attitudes and Beliefs, Cognitive Skills, Learning Technologies, Motivation, Multimedia Learning, Physical Sciences, Qualitative Methods, Quantitative Methods, Vocational Education

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 08 - Motivation and Emotion

Chairperson: Liesbeth Baartman, Utrecht University of Applied Sciences, Netherlands

Factors influencing VET teachers' intention to use technology in the COVID-19 era

Keywords: Attitudes and Beliefs, Learning Technologies, Quantitative Methods, Vocational Education

Presenting Author:Chiara Antonietti, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:**Martina Rauseo, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:**Francesca Amenduni, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:**Alberto Cattaneo, Swiss Federal Institute for Vocational Education and Training, Switzerland

The aim of the present study was to identify predictors of Swiss Vocational Education and Training (VET) school teachers' behavioral intention to use technologies in the classroom after the end of remote teaching caused by Covid-19 pandemic. Previous studies investigated teachers' technology acceptance and integration in several educational context; however, to our knowledge, there are not research studies on VET teachers' intention on technology use in the era of Covid-19 yet. Due to the emergency that leaded to distance learning adoption, teachers might have developed different beliefs related to technology use for teaching and learning. Based on Unified theory of acceptance and use of technology (UTAUT) model and its extensions, we conceptualized performance expectancy (PE), effort expectancy (EE), and anxiety (ANX) as predictors of technology use behavioral intention (BI). In addition, technology self-efficacy (SE) was hypothesized affecting PE and EE. Structural equation model was built with data from an online survey of 1977 Swiss VET school teachers to test the hypothesized model. Results partially confirm our hypotheses. BI to use technology in classroom teaching is positively affected by PE and negatively by ANX; the direct effect of EE on BI is not significant. PE and EE are both affected by technology SE, which negatively correlates with ANX. In sum, the belief that using technology helps teachers to realize their tasks efficiently and increases their teaching performance seems to have a great relevance in determining teachers' intention to use technology in future.

Fostering Apprentices Observation Through Annotations and Descriptions

Keywords: Cognitive Skills, Learning Technologies, Multimedia Learning, Vocational Education

Presenting Author:Alessia Eletta Coppi, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:**Alberto Cattaneo, Swiss Federal Institute for Vocational Education and Training, Switzerland; **Co-Author:**Jean-Luc Gurtner, University of Fribourg, Switzerland

Visual-skills are essential in many professions but are mainly studied in white-collar ones despite the fact that many workers rely on observation. For instance, beauticians' apprentices study how to visually discriminate skin anomalies to provide the correct treatment for their clients and identify dangerous anomalies to refer to a doctor. However, beauticians receive limited training compared to professionals like dermatologists, which can lead to performing wrong treatments and incur in potential skin damage. Therefore, this study draws from existing trainings developed for dermatologists and literature on signalling to foster apprentices' observation of skin anomalies images. The sample, composed by a class of 9 apprentices in their second year, was exposed to pre-test on observation and descriptions of skin anomalies' images; then the class attended a series of training sessions on skin anomalies for the rest of the second semester (performed in a the learning-platform). Finally, it was exposed to a post-test, a questionnaire and a focus group. A second class of the third year was also used as a control group.

Results show that the experimental group wrote almost double the amount of details written by the control; which indicates that the training surpasses the results of a traditional course on skin anomalies. Also, results from the questionnaire and the focus group indicate that apprentices perceived annotations and descriptions as useful tools to help them observe images, and they confirmed their interest in continuing using the learning platform in their course.

Feasibility and Acceptability of 'Sit-to-Stand' Desks in the VET Setting, A Qualitative Study

Keywords: Motivation, Physical Sciences, Qualitative Methods, Vocational Education

Presenting Author:Mara Kirschner, Open University of the Netherlands, Netherlands

While it has been shown that interrupting a person's sedentary behaviour has the potential to improve cognitive, physical and mental health, a large part of time students spend in school is mostly sedentary. As research has shown that approximately 80% of Vocational Education and Training (VET) students have an unhealthy sedentary lifestyle, implementing 'sit-to-stand' (StS) desks could interrupt sedentary behaviour and promote a more healthy behaviour. Therefore, the acceptability and feasibility of using such desks in the VET setting should be investigated. Using semi-structured focus group interviews analysed via deductive content analysis, the opinions of 33 students for the following topics were assessed: (1) usage of the standing option of the desks (2) reasons for standing in class (3) experienced effect of standing behind the desk, and (4) fostering future StS desks usage. Although VET students are aware of the potential benefits of using StS desks, they need to be actively stimulated and motivated by teacher to use them. In addition, time is needed to get used to a habit of standing. Thus, for successful implementation of standing desks in the VET setting all stakeholders (i.e., students, teachers, schoolboards) should be actively involved in stimulating healthy behaviour of VET students.

Session P 11

25 August 2021 18:45 - 19:45

Session Room 2

Single Paper

Instructional Design, Learning and Social Interaction, Teaching and Teacher Education

Argumentation, Dialogue and Reasoning

Keywords: Argumentation, Attitudes and Beliefs, Citizenship Education, Collaborative Learning, Cultural Diversity in School, In-service Teacher Education, Interdisciplinary, Mathematics, Metacognition, Peer Interaction, Primary Education

Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Mirjam Burget, University of Tartu, Estonia

Fostering primary students' competence of data-based argumentation – An intervention study

Keywords: Argumentation, Mathematics, Metacognition, Primary Education

Presenting Author:Jens Krummenauer, Ludwigsburg University of Education, Germany; **Co-Author:**Sebastian Kuntze, Ludwigsburg University of Education, Germany

As discourse in modern societies is often based on statistical data, data-based argumentation can be seen as an important competence for active citizenship. First empirical studies have provided evidence that already students in primary school can be able to develop data-based arguments. At the same time, these studies also revealed specific difficulties, which appear to be related to difficulties in students' scientific reasoning. Empirical evidence on whether and how primary students' competence in data-based argumentation can be fostered is relatively scarce, in particular with an intervention focus on students' scientific reasoning. Addressing this research need, an intervention study with N = 357 third- and fourth-graders has been conducted in order to evaluate the effectiveness of an intervention targeting at scientific reasoning strategies in data-based argumentation. The study follows a quasi-experimental control group design with three points of measurement. The students' competence was measured by means of a Rasch-scaled test instrument. In the intervention group, significant effects with medium to high effect sizes have been found, whereas no competence development was observable in a non-treatment control group as well as in another group with a reference treatment focusing on dealing with representations of data. The results show that it is possible to foster the competence of data-based argumentation in third and fourth grade students and provide evidence for an interrelatedness of the competence of data-based argumentation and the availability of related scientific reasoning strategies.

Deliberative Teaching for Sustainable Citizenship: An Emerging Field?

Keywords: Argumentation, Citizenship Education, Cultural Diversity in School, Peer Interaction

Presenting Author:Antonia Larrain, Universidad Alberto Hurtado, Chile; **Co-Author:**María Teresa Rojas, Universidad Alberto Hurtado, Chile; **Co-Author:**Gabriel Fortes, Universidad Alberto Hurtado, Chile

Democracies are increasingly dependent on sustainable citizenship, that is, the active participation and engagement with the exercise of rights in a field of plural interests, often contradictory and in conflict. This type of citizenship not only requires social inclusion, and habits of knowledge and evidence-based reasoning, but also argumentation skills as the individual and social capacity to dispute and exercise individual and social rights, and to deal peacefully with socio-political conflicts. There is ample empirical evidence showing that educational deliberative argumentation has a lasting impact on the deep and flexible understanding of knowledge; argumentation skills; and political and citizenship education. However, these three trends of research have developed independently with insufficient synergy. Considering the relevance of deliberative education for contemporaneous democracies and sustainable citizenship, in this paper we advance the foundations of what will be called deliberative teaching. We aim to propose a comprehensive integration of a thus-far disperse literature on argumentation and/or education, highlighting the main theoretical and empirical gaps and challenges that remain, and the possibilities of advancing our knowledge and educational impact that this integrating field could offer.

Interdisciplinary Dialogic Education and the Challenge of Disciplinary Egocentrism

Keywords: Attitudes and Beliefs, Collaborative Learning, In-service Teacher Education, Interdisciplinary

Presenting Author:Lihi Telem, Technion - Israel Institute of Technology, Israel; **Co-Author:**Einat Heyd-Metzuyanim, The Technion Israel Institute of Technology, Israel

Progressive approaches to teaching and learning, involving interdisciplinary and dialogic teaching and learning, are difficult to implement within schools. Teachers' attitudes and perceptions impact the success of said implementation and should be addressed by pedagogical designers. This study examines teachers' perceptions and attitudes towards interdisciplinary and dialogic instruction. We focus on teachers' perception of their discipline as it relates to an interdisciplinary program aimed at teaching middle school students to dialogically discuss real-life dilemmas. The study involved interviews with four teachers of different disciplines (mathematics, science, and humanities) who participate in the year-long project, as well as observations of teachers' group discussions. We use the concept of disciplinary egocentrism to account for teachers' general approaches and perceptions.

Session P 12

25 August 2021 18:45 - 19:45

Session Room 11

Single Paper

Learning and Social Interaction

Artificial Intelligence in Conversation and Discourse Analysis

Keywords: Argumentation, Artificial Intelligence, Collaborative Learning, Conversation/Discourse Analysis, Language (L1/Standard Language), Science Education, Secondary Education, Teacher Professional Development, Teaching/Instruction

Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Sonia Ilie, University of Cambridge, United Kingdom

Automatically Measuring Features of Teacher Discourse from Classroom Audio in English Language Arts

Keywords: Artificial Intelligence, Conversation/Discourse Analysis, Language (L1/Standard Language), Teaching/Instruction
Presenting Author:Sidney D'Mello, University of Colorado Boulder, United States; **Co-Author:**Emily Jensen, University of Colorado Boulder, United States;
Co-Author:Meghan Elizabeth Dale, University of Pittsburgh, United States; **Co-Author:**Patrick Donnelly, Oregon State University Cascades, United States; **Co-Author:**Amanda Godley, University of Pittsburgh, United States; **Co-Author:**Sean Patrick Kelly, University of Pittsburgh, United States

Professional development opportunities for teachers are rarely based on objective measures of teacher practice. To address this barrier to teacher learning, we aim to provide automated feedback on key aspects of teacher talk using classroom audio. We report on the development of natural language and machine learning models that automatically measure seven key features of dialogic talk in teacher discourse. Our approach achieves an average 0.85 accuracy (compared to human experts) in identifying these discourse features in individual teacher utterances from 127 classroom observations. When these predictions are averaged to obtain a proportional occurrence for each class session, we find an average observation-level correlation of 0.56. These results show the feasibility of automatically detecting specific features of teacher talk from classroom audio and open the door for data-driven teacher feedback and reflection.

Automatic classification of semantic content of classroom dialogue in core subjects

Keywords: Artificial Intelligence, Collaborative Learning, Conversation/Discourse Analysis, Teaching/Instruction
Presenting Author:Yu Song, South China Normal University, China; **Co-Author:**Shunwei Lei, South China Normal University, China; **Co-Author:**Tianyong Hao, South China Normal University, China

Due to benefits for teaching and learning, an increasing number of studies have focused on classroom dialogue and how to make it productive. Coding, in which the transcribed conversation is allocated to a set of features, is commonly employed to deal with the textual data arising from this dialogue. This is generally done manually and cannot provide timely feedback to the participants. To address this issue, we explored the possibility of automatically classifying the semantic content of classroom dialogue. Machine learning techniques were applied to a large corpus of 155 lessons in mathematics, literacy and science/physics recorded in primary and secondary schools across China. Seven categories (analysis, coordination, speculation, uptake, agreement, querying, and prior knowledge) were distinguished automatically using an artificial neural network-based model. The model achieved acceptable performance and was comparable to human coding, as reflected by three indexes, precision, recall and F-1 score. Information about quality of dialogue can be identified in a timely manner and classroom dialogue can be managed more skilfully.

ClassInSight: Automating Analysis of Classroom Dialogue to Support Teacher Noticing and Reflection

Keywords: Artificial Intelligence, Conversation/Discourse Analysis, Science Education, Teacher Professional Development
Presenting Author:Saranya Venkatraman, The Pennsylvania State University, United States; **Co-Author:**Prasenjit Mitra, Penn State College of Information Sciences and Technology, United States; **Co-Author:**Sherice Clarke, University of California, San Diego, United States; **Co-Author:**Andrea Gomoll, University of California, San Diego, United States; **Co-Author:**Zayab Gates, University of California, San Diego, United States; **Co-Author:**Sushil S, University of California, San Diego, United States; **Co-Author:**Tarang Tripathi, University of California, San Diego, United States; **Co-Author:**Amy Ogan, Carnegie Mellon University, United States

ClassInSight is a personal informatics (PI) system that aims to analyse, visualize and present insightful information on classroom discourse for teachers to reflect on and notice aspects of talk-mediated instruction. It comprises an end-to-end pipeline to transform classroom dialogue recordings into representations of practice (visualizations of discussion lessons) to support teachers' situated reflection on practice to support professional learning facilitating classroom dialogue in ways that foster student thinking and learning. The current work is focused on an intermediate step in this transformation of dialogue data to insightful visualizations: the codification of classroom dialogue. Codifying classroom dialogue into meaningful discourse units enables the systematic and statistical analysis of classroom patterns and the nature of classroom discourse that can be visualized and interpreted by teachers. It is through representing these discourse units, which are informed by theory and research on classroom dialogue (e.g Author, 2015), that our design for teacher professional development uses *implicit scaffolds* for teacher noticing and reflection on features of dialogue that are productive for student learning. In this current work, we show that this annotation process can be successfully automated using machine learning (ML) techniques with over 80% accuracy on our dataset. Automating analysis of classroom discussions will allow for rapid cycles of instruction and reflection-on-practice by significantly reducing the time from data recording to visualization in ClassInSight.

Development of an Automated Tool to Track Secondary English Students' Collaborative Argumentation

Keywords: Argumentation, Conversation/Discourse Analysis, Language (L1/Standard Language), Secondary Education
Presenting Author:Amanda Godley, University of Pittsburgh, United States; **Co-Author:**Christopher Olshefski, University of Pittsburgh, United States; **Co-Author:**Diane Litman, University of Pittsburgh, United States; **Co-Author:**Luca Lugini, Ancestry, United States; **Co-Author:**Ravneet Singh, University of Pittsburgh, United States

Collaborative argumentation—the building of evidence-based, reasoned knowledge through dialogue—is essential to individual learning as well as group problem-solving (Engle & Conant, 2002). Research has found, however, that the amount of instructional time spent on students' collaborative argumentation is far less than the time spent on teacher lectures or individual work, despite links between collaborative argumentation and learning gains (Applebee et al., 2004). To address these challenges, we developed a computer-based system that leverages recent advances in human language technologies to analyze transcripts of students' spoken collaborative argumentation in high school English Language Arts (ELA) classrooms and to provide teachers with graphic representations of student talk. We report on teacher learning associated with our system, the distribution of three student talk features across discussions (argumentation, elaboration/specifity, and collaboration), and the current status of our system's classifiers to inform our development of an automated system.

Session P 13

25 August 2021 18:45 - 19:45

Session Room 9

Workshop

Motivational, Social and Affective Processes

The Value of Linguistic Analysis for Educational Research

Keywords: Assessment Methods and Tools, Conversation/Discourse Analysis, Emotion and Affect, Qualitative Methods
Interest group:

Linguistic analysis has been gaining popularity among educational researchers due to its high potential and conclusive results when being employed. The current workshop aims to introduce linguistic analysis as a valuable methodological approach in educational research and to raise awareness of its affordance. The participants will be working in small groups to perform linguistic analysis of reflective writing samples; explanations and close guidance will be provided. The analysis will focus on the following linguistic markers: personal pronouns to study participants' foci of attention as well as group- vs. self-focused narratives; emotion words to measure the extent of emotional immersion in the discourse; semantic fields of specific words and phrases to evaluate speakers' views of various educational phenomena; instances of verbal intensification to study meaningful emotional experiences. We believe that the workshop will inspire scholars to implement linguistic analysis in the future in accordance with their own research goals and theoretical perspectives.

The Value of Linguistic Analysis for Educational Research

Presenting Author:Yulia Muchnik-Rozanov, Technion - Israel Institute of Technology, Achva Academic College, Israel; **Co-Author:**Dina Tsybulsky, Technion - Israel Institute of Technology, Israel

Linguistic analysis has been gaining popularity among educational researchers due to its high potential and conclusive results when being employed. The current workshop aims to introduce linguistic analysis as a valuable methodological approach in educational research and to raise awareness of its affordance. The participants will be working in small groups to perform linguistic analysis of reflective writing samples; explanations and close guidance will be provided. The

analysis will focus on the following linguistic markers: personal pronouns to study participants' foci of attention as well as group- vs. self-focused narratives; emotion words to measure the extent of emotional immersion in the discourse; semantic fields of specific words and phrases to evaluate speakers' views of various educational phenomena; instances of verbal intensification to study meaningful emotional experiences. We believe that the workshop will inspire scholars to implement linguistic analysis in the future in accordance with their own research goals and theoretical perspectives.

Session P 14

25 August 2021 18:45 - 19:45

Session Room 7

Collaborative Workspace

Current Debates in Psychometrics and Applied Statistics: Implications for Educational Research

Keywords: Assessment Methods and Tools, Doctoral Education, Quantitative Methods, Researcher Education

Interest group: SIG 17 - Methods in Learning Research

In this collaborative workspace, we aim at exploring the implications of three related debates in psychometrics and applied statistics for research on learning and instruction. The first debate is around different types of statistical models of measurement: Rasch modeling, item response theory, reflective and formative factor models, and network models. Recent research has shown strong statistical commonalities between these models. We will discuss how this impacts model choice in educational research: Does it even matter, and what are the distinct advantages of each model in different research contexts?

The second debate is between multilevel modeling, fixed effects modeling, and cluster-robust standard errors. The consideration of clustered data structures (e.g., students nested in school classes or multiple measurement points) has become an everyday issue in educational research, but it has yet to be discussed what the advantages of the different approaches for the treatment of clustered data are.

Finally, whether sum scores, factor scores, or estimates from item response modeling should be used for statistical analyses is an open debate. These three debates share overlap. We will discuss this overlap and implications of recent insights within the literature relating to these debates for research on learning and instruction, setting the stage for a collaborative project on these issues. The aim of this session is to develop a collaborative project in which these three issues are examined as interrelated research questions. Thus, a large part of the time is reserved for discussion. Collaborators are invited to become co-authors of the resulting article.

Current Debates in Psychometrics and Applied Statistics: Implications for Educational Research

Presenting Author:Peter Edelsbrunner, ETH Zurich, Switzerland; **Co-Author:**Christian Thurn, ETH Zurich, Switzerland

In this collaborative workspace, we aim at exploring the implications of three related debates in psychometrics and applied statistics for research on learning and instruction. The first debate is around different types of statistical models of measurement: Rasch modeling, item response theory, reflective and formative factor models, and network models. Recent research has shown strong statistical commonalities between these models. We will discuss how this impacts model choice in educational research: Does it even matter, and what are the distinct advantages of each model in different research contexts?

The second debate is between multilevel modeling, fixed effects modeling, and cluster-robust standard errors. The consideration of clustered data structures (e.g., students nested in school classes or multiple measurement points) has become an everyday issue in educational research, but it has yet to be discussed what the advantages of the different approaches for the treatment of clustered data are.

Finally, whether sum scores, factor scores, or estimates from item response modeling should be used for statistical analyses is an open debate. These three debates share overlap. We will discuss this overlap and implications of recent insights within the literature relating to these debates for research on learning and instruction, setting the stage for a collaborative project on these issues. The aim of this session is to develop a collaborative project in which these three issues are examined as interrelated research questions. Thus, a large part of the time is reserved for discussion. Collaborators are invited to become co-authors of the resulting article.

Session P 15

25 August 2021 18:45 - 19:45

Session Room 14

Roundtable

Lifelong Learning, Teaching and Teacher Education

Lifelong and Workplace Learning

Keywords: Content Analysis, Cultural Psychology, Developmental Processes, Higher Education, Lifelong Learning, Mixed-method Research, Student Learning, Teacher Professional Development, Workplace Learning

Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development

Chairperson: Ingvill Rasmussen, University of Oslo, Norway

Mentor's perspectives on long-term internships at school: An exploratory study

Keywords: Content Analysis, Student Learning, Teacher Professional Development, Workplace Learning

Presenting Author:Carina Caruso, University of Paderborn, Germany; **Co-Author:**Michael Goller, University of Paderborn, Germany

Internships are an important part of many teacher education programmes around the world. From a theoretical perspective, such internships aim at student teachers' development of competencies by experiential learning through the engagement in school practice as well as by relating those practice-based experience with theoretical and conceptual knowledge learned at university (e.g., Allen & Wright, 2014). Within the literature, mentors—that is, more experienced teachers that support, coach, and evaluate student teachers (e.g., Carver & Katz, 2004; Wang, 2018)—have been emphasised to play an important role in these development processes. In fact, without the guidance of more experienced practitioners, student teachers quickly lose themselves in the complexity of pedagogical situations, are incapable to recognize and interpret what is going on in schools, as well as are unable to reflect their experiences theoretically (Berliner, 2001). And although the importance of mentors have often been acknowledged (e.g., Caruso, 2019) almost nothing is known about the mentors' perspective on student teachers' internships as well as on the development processes they are supposed to support and supervise. The aim of this contribution is close this research gap. Based on an interview study with 23 experienced teachers that regularly serve as mentors during internships the following research questions will be answered: (a) What professional goals do mentors attribute students' teacher internships and how do they try to meet those goals? (b) What challenges do mentors face during their mentorship practice in the context of internships?

Practical experience and its influence on self-assessed competences of teacher students

Keywords: Higher Education, Mixed-method Research, Teacher Professional Development, Workplace Learning

Presenting Author:Carina Caruso, University of Paderborn, Germany; **Co-Author:**Michael Goller, University of Paderborn, Germany

A lot of research on teachers' professional development focuses on formal learning in educational institutions. Competence-based teacher training raises questions for empirical research particularly regarding the impact of internships and practical phases as regular parts of study programmes: At the same time, many teacher education programmes nowadays implemented long-term internships. The main purpose of these internships aims at the development of competencies and skills through practical experience. This contribution discusses (1) challenges and potentials of learning in practice as well as (2) exemplary findings of a mixed-methods study that investigates the development of self-perceived didactic competencies and skills of teacher students during a long-term internship (5 months) in a German teacher education master programme. The results reveal in which didactic fields the students improved during the internship and in which they did not. Furthermore, the results reveal that the students do not expect to be able to combine theory and practice after the internship. This finding is analysed with reference to findings about mentoring in practical phases.

Transitioning away from tertiary education: Adolescents embracing and resisting future scripting

Keywords: Cultural Psychology, Developmental Processes, Lifelong Learning, Mixed-method Research

Presenting Author:Alexandros Janse, Universiteit Utrecht, Netherlands; **Co-Author:**Larike Bronkhorst, Utrecht University, Netherlands; **Co-Author:**Sanne Akkerman, Utrecht University, Netherlands; **Co-Author:**Thea van Lankveld, Utrecht University, Netherlands

In tertiary education settings, making important career-related life-choices is largely considered an individual affair. ‘Who are you, what can you do, what do you want?’ are common questions in Dutch study and career counseling. Even though these type of decisions are treated like an individual affair, they are inherently related to multiple and sometimes contradicting societal norms and expectations about what a good future entails. These norms are often considered to be rather abstract and context-independent. However, recent empirical work also explicated that more situated norms and expectations have a large impact on how students position themselves towards their future, through personal narrations which are intertwined with their sense of self and the world. We conceptualize these more situated and contextual norms about the future as *future scripting*. In this study we explore how different forms of future scripting are experienced by adolescents across different tertiary education studies (clustered by content domains), and across different educational tracks (from more vocational and applied to more theoretical and academic). Longitudinal interviews (3 x 30 adolescents) and open-ended questionnaires (3 x 227 adolescents) were conducted over the course of three year in order to explicate experiences of future scripting over time (before and after graduation) in the interviews, and confirm and extend these developmental findings in a larger sample trough the longitudinal open-ended questionnaires.

Session P 16

25 August 2021 18:45 - 19:45

Session Room 15

Invited Symposium

Culture, Morality, Religion and Education

SIG 19: Religions and worldviews for 21st century citizenship skills

Keywords: Citizenship Education, Competencies, Higher Education, Morality, Pre-service Teacher Education, Religious Studies, Student Learning

Interest group: SIG 19 - Religions and Worldviews in Education

Chairperson: Laura Hirsto, University of Eastern Finland, Finland

Organiser: Martin Ubani, University of Eastern Finland, Finland

Discussant: Alexander Unser, TU Dortmund University, Germany

The topic of this symposium is Religions and worldviews in 21st century citizenship skills. Especially in Western educational systems, policy-makers have issued statements grounding public education in what are called “transferable skills”, “generic skills” or 21st century skills. Here the integral question has been what kind of skills the citizens of today and tomorrow should have for them to be able to navigate diverse, evolving and complex knowledge societies (see Griffin, Care & McGraw; Binkley et al. 2012) and to maintain the competitiveness of a given society (OECD2018). Arguably religion and citizenship has an ambiguous relationship. While on the one hand it is assumed that religions convey values for social cohesion and can be schools of democracy in which civic virtues are acquired, history shows on the other hand that religions have also repeatedly rejected democratic rules and equality rights (Herbert, 2003; Young, 2007). Based on these observations, there is an intense debate in the educational science community about whether and how religious education (RE) can contribute to citizenship education (Jackson, 2003; Zembylas & Loukaidis, 2018). While some authors argue that RE should focus on the development of civic values grounded in religious traditions (Hansen, 2011; Willems et al., 2010), others suggest reflecting on the conflicts and dilemmas associated with the relationship between religion and citizenship (Gearon, 2004). Hence, the SIG19 invited symposium discusses the possibilities and limits of RE's contribution to citizenship education in the 21st century. In addition to clarifying theoretical issues, current empirical findings will be presented.

Religions and worldviews: 21st century education for citizenship.

Presenting Author:Rob Freathy, University of Exeter, United Kingdom

This presentation will focus on religions and worldviews in the framework of 21 century education for citizenship by using historical and theoretical analysis. The underlying thought in this presentation is that in order to meet with the demands of the multi-cultural, multi-faith, religiously and non-religiously plural society of today, religious education in England needs to evolve beyond the kind of religious education for citizenship approach that has underpinned education for decades. As a conclusion a research-based pedagogical approach based on ‘Big ideas’ is presented. The approach presented challenges the binary oppositions that have traditionally distinguished the disciplines of Theology from Religious Studies, and argues in favor of the application of various forms of theology and theological inquiry within a critical, dialogic and inquiry-led approach to the study of religion(s) and worldviews(s) for 21st century citizenship.

University students growing up to be experts – supporting students citizenship skills?

Presenting Author:Sanna Väistönen, University of Eastern Finland, Finland; **Co-Author:**Laura Hirsto, University of Eastern Finland, Finland

This paper investigated university teachers' perspectives on university students learning of 21st century skills during university courses applying flipped classroom approach. Data was drawn from 22 interviews with university teachers who had participated in an educational development project in which they were supported to transform their courses according to the design and guidelines of flipped classroom approach. According to results, university teachers considered that flipped classroom approach naturally supported student in developing many dimensions of 21st century skills. However, more abstract skills of creativity, innovation or citizenship seemed not to be supported. The teachers also considered that flipped classroom approach seemed to support the key processes of integrative pedagogy model (e.g. Tynjälä et al. 2011, Tynjälä, Häkkinen, & Hämäläinen, 2014; Tynjälä, et al., 2016) which describes the elements that are needed for supporting students in developing their expertise. These elements were transforming theory into practice, conceptualizing practice with theoretical tools and partially the reflective process though which students would continuously reflect their theoretical and practical understanding. However, the Integrative pedagogy model also includes the sociocultural context in which the teaching-learning situation is embedded, and students' motivational and emotional processes. These perspectives seem not to be actively considered by these teachers, and this seems to be related to the challenges of supporting students' more abstract and complex skills such as citizenship. This paper discusses the challenges and tensions in developing university education from university teachers' perspective in relation to supporting students' learning of 21st century skills.

Research-based development of RE teacher education in light of 21st century skills

Presenting Author:Martin Ubani, University of Eastern Finland, Finland; **Co-Author:**Arto Kallioniemi, University of Helsinki, Finland; **Co-Author:**Kaisa Viinikka, University of Eastern Finland, Finland; **Co-Author:**Tuuli Lipiäinen, University of Helsinki, Finland

In our presentation we will elaborate the outcomes a three-year research-based curriculum development project on Finnish RE teacher education (2018-2021). In our project we have used both the P21 and ACTS21 frameworks for evaluation, research and curriculum development. The research questions were RQ1. What do the in-service teachers perceive as the competence requirements for successful RE practice today and in future, RQ2. What is the contribution of the pedagogical studies, teaching practice and major subject studies in the development of 21st century skills and professional thinking?, and RQ3. How would the in-service teachers and principals and pre-service teachers develop curricula (including major studies) to meet with the 21st century requirements? The project included quantitative and qualitative data from for instance in-service and pre-service teachers. The project has produced empirical results and several publications on teacher development and skill requirements in light of the “new transformable learning skills”, (Viinikka, K. & Ubani, M. 2019; Viinikka, Ubani, Lipiäinen & Kallioniemi 2019; Viinikka, Ubani, Lipiäinen & Kallioniemi 2019; Viinikka K. & Ubani, M. 2020; Viinikka, Ubani & Lipiäinen 2021) and finalizing a report with recommendations, models and courses for teacher education, especially RE teacher education. The key processes identified in the project focused on a) faculty conceptions, b) research process and c) project execution. In presentation we wish to reflectively summarize the empirical results of the project and

show the implications they have had during the course of the project but also the implications they have for future development of teacher education.

Session P 17

25 August 2021 18:45 - 19:45

Session Room 1

Symposium

Instructional Design

Multiple perspectives on seductive details

Keywords: Educational Psychology, Educational Technology, Experimental Studies, Game-based Learning, Instructional Design, Motivation and Emotion, Multimedia Learning, Neuroscience, Qualitative Methods, Quantitative Methods

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 27 - Online Measures of Learning Processes

Chairperson: Christian Schäringer, Leibniz-Institut für Wissensmedien, Germany

Chairperson: Manuel Ninaus, University of Innsbruck, Austria

Organiser: Christian Schäringer, Leibniz-Institut für Wissensmedien, Germany

Organiser: Manuel Ninaus, University of Innsbruck, Austria

Discussant: Jan L. Plass, New York University, United States

In the proposed symposium we want to shed light on and discuss the effects of seductive details (SD) from multiple perspectives. Initially defined in the area of research on instructional design, SD are additional elements used to augment task materials, typically designed to be interesting and attention-capturing, and hence thought to be motivationally stimulating, yet only loosely content-related and not necessarily needed for understanding the primary learning content. Why and when SD result in beneficial or detrimental effects on learning outcomes is still a matter of debate. The multiple perspectives on SD we will present and try to critically integrate into a coherent picture are *multiple* both, with respect to the measures used to study the SD effect, as well as with respect to the task settings we focus on. With respect to measures, we extend the classical focus on outcome measures (i.e., learning success) by additionally incorporating process measures ranging from qualitative data like think-aloud protocols to quantitative data like performance data, subjective ratings, up to physiological process measures like eye-tracking, heart-rate, EEG, and fMRI. With respect to task settings, we extend the classical focus on instructional materials like text and pictures by additionally focusing on educational games and virtual reality applications. In doing so we hope to not only extend the view on SD in the current symposium, but also to better understand when and how SD are working.

Looking behind the scenes of seductive details: Combining Eye-Tracking and Thinking-Aloud

Presenting Author: Babette Park, Leuphana University Lueneburg, Germany; **Co-Author:** Andreas Korbach, Saarland University, Germany; **Co-Author:** Lisa Stark, Saarland University, Germany; **Co-Author:** Roland Bruenken, Saarland University, Germany

The two presented studies are a part of a series of contributions on the seductive details effect from our workgroup. The selected studies open a methodological perspective on how to get more insights into the seductive details effect. The first study combines seductive details with thinking aloud protocols for a first validation of thinking aloud to be a valid method for analyzing the seductive details effect. The second study shows how the qualitative analysis of thinking-aloud protocols offers a new perspective on the effect of seductive details by combining eye-tracking and thinking aloud data. In both studies, the seductive details effect was confirmed showing the detrimental effect of seductive details. In the first study it turned out that the seductive details effect is confirmed to be stable also under the thinking-aloud condition, as no interaction effects between both factors, seductive details (with vs. without) and thinking-aloud protocols (with vs. without) were found. From a methodological point of view, this result leads to the implication that thinking-aloud can be a useful method for analyzing the seductive details effect more deeply. Moreover, by the second study it can be shown how thinking-aloud protocols can widen our perspective by using qualitative research methodology.

Using EEG and Eye-Tracking to study the seductiveness of decorative pictures

Presenting Author: Christian Schäringer, Leibniz-Institut für Wissensmedien, Germany

In research on the seductive details effect often combinations of text and pictures are used as interesting and attention capturing (i.e. seductive) elements added to learning materials. In the current research project we were interested in the seductive effects of decorative pictures (DP) alone when added to learning texts and to working memory tasks. The additional increase of working memory load has been discussed as one reason for the detrimental effects of seductive details on learning. Therefore, we were specifically interested in whether DP would result in increased working memory load as measured by the alpha and theta frequency band power of the electroencephalogram (EEG) and pupil dilation. By not only using a text reading task but also a classical working memory task of neuroscientific research, we additionally aimed at studying the feasibility and validity of the EEG as process measure of working memory load in more complex task materials. For text reading, the results revealed no effects of DP on learning outcomes, reading times, pupil dilation or EEG theta frequency band power. Yet in the EEG alpha frequency band power a significant effect of DP was visible. For the working memory task, there were also no effects of DP on task performance, pupil dilation, or EEG theta power, but again on the EEG alpha power. Subjective ratings confirmed DP to result in increased effort which is reflected by the EEG alpha power indicating the usefulness of this measure in research on instructional design.

Seductive details in immersive virtual reality

Presenting Author: Jocelyn Parong, University of Wisconsin - Madison, United States; **Co-Author:** Richard Mayer, University of California, Santa Barbara, United States

Seductive details in immersive virtual reality (IVR) may not only be presented as irrelevant, but interesting facts, but also in the form of user interactions and movements inherent to the technology. When these features are not pertinent to the learning goals of the lesson, they may instead add to the learner's cognitive load, and in turn lead to poorer learning outcomes. In two experiments, learning outcomes of lessons displayed in immersive virtual reality (IVR) versus traditional methods and the underlying cognitive and emotional mechanisms of learning were examined. Students viewed either a biology lesson (Exp. 1) or history lesson (Exp. 2) in IVR or a desktop lesson. Those who viewed a PowerPoint (Exp. 1) or video (Exp. 2) lesson performed significantly better on a post-test than the IVR groups. In Experiment 1, learners in IVR reported higher extraneous cognitive load, and were less cognitively engaged based on EEG measures. In Experiment 2, learners in IVR were less cognitively engaged, reported more positive, high-arousal emotions, and exhibited higher heart rate. The results suggest that seductive details inherent to IVR may cause increased irrelevant cognitive or affective processing, which leads to poorer learning outcomes than traditional methods.

Using fMRI to investigate the emotional effects of seductive details in a game-based learning task

Presenting Author: Manuel Ninaus, University of Innsbruck, Austria; **Co-Author:** Simon Greipl, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:** Kristian Kiili, Tampere University, Finland; **Co-Author:** Antero Lindstedt, Tampere University of Technology, Finland; **Co-Author:** Johannes Bloechle, Department of Psychology, University of Tübingen, Germany; **Co-Author:** Julia Bahnmüller, Centre for Mathematical Cognition, Loughborough University, United Kingdom; **Co-Author:** Elise Klein, Université de Paris, France; **Co-Author:** Hans-Otto Karnath, Hertie-Institute for Clinical Brain Research, University of Tübingen, Germany; **Co-Author:** Korbinian Moeller, Centre for Mathematical Cognition, Loughborough University, United Kingdom

The use of games or game-like tasks for learning has become increasingly popular over the last years as meta-analyses suggest a positive effect on learning outcomes and motivation. However, adding game elements to learning tasks might distract learners from the overall objective of the learning task and thus are often considered to be seductive. In the current study, we aimed at investigating the emotional effects of game elements on a neurofunctional level. In particular, 41 adult participants completed both a game and non-game-based (no-game) math learning task while their brain activity was measured using functional magnetic resonance imaging (fMRI). The game version of the task included seductive details in terms of game elements (i.e. richer visual design that corresponded to the narrative of the game). Both game and no-game version of the task provided corrective feedback. We evaluated participants brain response to feedback in the game and no game version of the task using a comprehensive set of regions of interest involved in processing rewards and emotions. The

majority of these regions of interests showed a stronger relative activation in the game as compare to the no-game version of the task. The number of errors committed was comparable across conditions but the game version was rated to be more attractive, of higher hedonic quality, and of less pragmatic quality. The current results provide first evidence on the neurofunctional mechanisms of game-based learning and supports theories of increased emotional engagement through game elements.

Session Q 1

26 August 2021 09:00 - 10:00

Session Room 18

Single Paper

Learning and Special Education

Special Education

Keywords: Content Analysis, Learning Disabilities, Science Education, Special Education, Teacher Professional Development, Teaching/Instruction

Interest group: SIG 15 - Special Educational Needs, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Helene Zeeb, University of Freiburg, Germany

Testing the Accessibility of Experimental Environments in Inclusive Science Classrooms

Keywords: Learning Disabilities, Science Education, Special Education, Teaching/Instruction

Presenting Author: Michaela Oettle, University of Education, Freiburg, Germany; **Co-Author:** Silke Mikelskis-Seifert, University of Education Freiburg, Germany; **Co-Author:** Wolfram Rollett, University of Education Freiburg, Germany; **Co-Author:** Katja Scharenberg, University of Education Freiburg, Germany

Scientific literacy is a prerequisite for social participation and can be fostered through learning environments in which students conduct scientific experiments on their own. For experimental environments to be effective, they need to be designed in such a way as to abolish physical, cognitive, affective, linguistic, social or other barriers in order to ensure access and participation in the experimental process for all students irrespective of their individual learning preconditions. The demand for accessibility must particularly adhere to the instructions provided to students in the context of the experimental environment. While accessibility is already well-defined in many areas of live, a definition in the context of experimental instructions is lacking. Our project gives a theoretically derived definition of accessible experimental instructions comprising four different accessibility aspects: Functional, linguistic and visual accessibility as well as accessibility to the experimentation. A corresponding instrument is introduced which measures the accessibility of typically used experimental instructions in Science classes as perceived by students. Using the instrument for data collection with $n=196$ secondary-school students in Germany confirmed the theoretically derived dimensionality of the measured construct. Typical psychometric quality criteria were verified suggesting the suitability of the instrument both to evaluate the perceived accessibility of currently used experimental instructions in Science classes and to assess potential need for change. Furthermore, the data revealed hints about which accessibility aspects of existing experimental instructions are perceived differently by groups of students with different learning prerequisites.

Individual Education Plans: Just a Tool to Immunize Teaching from Parental Criticism?

Keywords: Content Analysis, Special Education, Teacher Professional Development, Teaching/Instruction

Presenting Author: Raphael Koßmann, University of Hildesheim, Germany

The use of Individual Education Plans (IEPs) is a long-established practice in many countries. Categorized as planning documents, their purported purpose is to provide school-based instruction that is more closely matched to pupils' skills and needs. In light of the widespread use of IEPs, the number of recent studies that examine authentic IEPs in terms of their content appears rather limited. Therefore, the present study investigated the extent to which these documents contain practically relevant information for teachers to implement in practice. Based on a sample of 112 authentic IEPs from one federal state in Germany, the support proposals in these documents were examined in detail. Results showed that about half of the entries consisted of common, content-specific methods to be carried out in school. On average, in only 30% of these entries per IEP, the content deviated from the curricula for a particular grade level. Another large proportion of support proposals consisted of common but content-unspecific methods to be carried out in school. These entries were mostly limited to generic practices of differentiated instruction and were usually not described in enough detail for implementation. Analyses of variance concerning specific contextual and structural characteristics of IEPs made it possible to assess the features of documents with higher potential information value for teachers and support staff. Overall, for most IEPs, it seems unlikely that they could fulfill their primary purpose. At the same time, there were indications about how they could be improved.

Session Q 2

26 August 2021 09:00 - 10:00

Session Room 6

Single Paper

Higher Education

Student Learning in Higher Education

Keywords: Educational Psychology, Higher Education, Learning Approaches, Mixed-method Research, Quantitative Methods, Student Learning, Teaching Approaches, Writing/Literacy

Interest group: SIG 04 - Higher Education, SIG 12 - Writing, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Jake McMullen, University of Turku, Finland

Students approaches to learning and study-related burnout in exceptional Covid19-situation

Keywords: Educational Psychology, Higher Education, Learning Approaches, Student Learning

Presenting Author: Henna Asikainen, University of Helsinki, Finland; **Co-Author:** Anna Parpala, University of Helsinki, Finland

The aim of this study is to compare university students' experiences of their approaches to learning and experiences of the teaching-learning environment in general and during the online studying in Covid19situation. The objective is also to analyse the relationship between students' experiences of approaches to learning, experiences of teaching-learning and study-related burnout in online studying in Covid19 situation. The aim is further to explore students' learning profiles and see how their experiences of study-related burnout in general and in Covid19 situation differ between the profiles. The participants were 665 first and second-year students. The results show that there are changes in students' approaches to learning and experiences of teaching-learning environment. In addition, we suggest that students' approaches to learning are related to components of study-related burnout more strongly than their perceptions of the teaching-learning environment in Covid19-situation. Furthermore, we suggest that students with a dissonant study profile experience most exhaustion and unreflected students experience most cynicism in online studying during the Covid19 situation.

Discipline-based vs project-based business curriculum: comparison of learning outcomes

Keywords: Higher Education, Quantitative Methods, Student Learning, Teaching Approaches

Presenting Author: Laura Helle, University of Turku, Finland; **Co-Author:** Eero Laakkonen, University of Turku, Finland, Finland; **Co-Author:** Maria Välivirta Havia, Turku University of Applied Sciences, Finland; **Co-Author:** Henny P. A. Boshuizen, Open University of the Netherlands, Netherlands

The purpose of the study was to compare learning outcomes in discipline-based business education and integrated project-based learning. The participants were 218 students ($k = 23$) in the final phase of their studies from three universities of applied sciences (UAS) each offering both types of education. The students were administered a test of domain-specific competence and a test of general causality orientations. The advanced students' responses were analyzed within a multilevel modeling framework. Results indicated no differences in domain-specific competence, but the pattern of general causality orientations was consistently more favorable in project-based learning. Further studies are needed to determine if this is due to the impact of the curriculum or student selection.

There is no evidence to suggest that the project-based curriculum is undermining basic disciplinary knowledge.

Writing retreats for master's thesis students: a productive space

Keywords: Higher Education, Mixed-method Research, Student Learning, Writing/Literacy

Presenting Author:Vibeke Ankersborg, Copenhagen Business School, Denmark

Structured writing retreats for master's thesis students held on campus enhance students' writing productivity and enhance students' insight into the research process if a holistic containment is established. The prerequisite for this is a facilitator showing strong leadership, a programme containing a variety of activities, a set of rules and a shared room for the students to work in. This study presents survey results from 11 writing retreats held over a period of four years at a university. The study confirms and expands Murray & Newton's (2009) model for structured writing retreat as well as Murray, Steckley, & MacLeod's (2012) Holistic Containment theory on writing retreats.

Session Q 3

26 August 2021 09:00 - 10:00

Session Room 3

Single Paper

Assessment and Evaluation, Learning and Social Interaction

Literacy and Assessment Methods

Keywords: Achievement, Assessment Methods and Tools, Early Childhood Education, Language (L1/Standard Language), Literacy, Parental Involvement in Learning, Primary Education, Survey Research

Interest group: SIG 01 - Assessment and Evaluation, SIG 05 - Learning and Development in Early Childhood

Chairperson: Paul Feltes, PH Freiburg, Germany

What we measure when measuring children's Home Literacy Environment: A comparison of methods

Keywords: Assessment Methods and Tools, Language (L1/Standard Language), Literacy, Parental Involvement in Learning

Presenting Author:Astrid Wirth, Ludwig-Maximilians-Universität München, Germany; **Co-Author:**Efsun Annac, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Frank Niklas, Ludwig-Maximilians-Universität (LMU), Germany

Children's Home Literacy Environment (HLE) focuses on reading habits in families and supports the development of early language and literacy competencies of children. However, prior studies used various different test methods to assess the HLE. This makes it difficult to assess the HLE's relation with children's competency development. In the current study, we compare common assessment methods of the HLE and their relation with various linguistic and literacy outcomes: A parental survey, an observation of parents' linguistic input at home (HOME), an observation of a shared reading interaction between caregiver and child, and a children book title recognition test (TRT-VS). Our sample consisted of $N = 190$ children with an average age of 64 months ($SD = 4.4$). All HLE measurements were significantly intercorrelated. The HOME observation and the TRT-VS checklist showed the strongest correlations with children's linguistic and literacy competencies ($r = .12 - .62$). Regression analyses were conducted to predict linguistic and literacy competencies by different aspects of the HLE while controlling for various child and family characteristics (age, intelligence, SES and migration background). All aspects of the HLE were significant predictors of children's expressive and receptive vocabulary and grammar, with the TRT-VS being the best predictor of children's competencies. We will present and discuss findings of a longitudinal research design including a second measurement point after 6 months.

Extensions of the books-at-home index and their relevance for academic language comprehension

Keywords: Assessment Methods and Tools, Literacy, Primary Education, Survey Research

Presenting Author:Birgit Heppt, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Melanie Olczyk, University of Leipzig, Germany; **Co-Author:**Anna Volodina, University of Bamberg, Germany

The number of books at home is a frequently used indicator for assessing students' social origin, but only little is known on the quality of this measure (e.g., Sieben & Lechner, 2019). The present study thus investigated the incremental validity of the number of books at home over and above other indicators of social origin for explaining students' academic language comprehension. Specifically, we examined the importance of selected extensions of the books-at-home index, namely the number of children's books and the number of ebooks, and explored the role of the source of information (i.e., whether information is given by parents or children). Based on a German sample of 2,353 elementary school children from Grades 2 through 4 ($M_{age} = 8.45$ years, $SD = 1.03$; 50% male, 54% multilingual), we found that parents' information on the number of books and children's books at home contributed to the explanation of students' academic language comprehension over and above SES and parental education. No effect emerged for the number of ebooks, however. Whereas children's information on their own and their parents' books was positively related to academic language comprehension, it did not further increase the amount of explained variance over parents' information. Our findings indicate that the number of ebooks does not compromise the validity of the traditional books at-home-index and that children's information is of limited predictive value, thus pointing to the robustness of the traditional books-at-home index when used in parent questionnaires.

The impact of the test administrator in assessing speech sound discrimination

Keywords: Achievement, Assessment Methods and Tools, Early Childhood Education, Literacy

Presenting Author:Renáta Kiss, MTA-SZTE Research Group on the Development of Competencies, Hungary; **Co-Author:**Dóra Mokri, University of Szeged, Hungary; **Co-Author:**Béni Csapó, University of Szeged, Hungary

Several observation protocols, tests and test batteries are available to assess children's abilities during the sensitive period of preschool-to-school transition. The cognitive components measured by these batteries have a common point: all of these assessment tools have a subtest or a set of items for assessing a significant aspect of children's language development: speech sound discrimination. These assessment tools could be based on face-to-face testing mode or could be computer based as well. The DIFER test battery's speech sound discrimination part contains oppositional word pairs. In case of the face-to-face testing mode the examiner/the administrator has a freedom of choice between two sounds and words, therefore the equivalence of the two tasks version should be examined. The study aims (1) to examine children's achievement during the test versions and (2) to identify the importance of the examiner's free choices between the two oppositional wordpairs. First data shows the lack of equivalency of the random test version. In one hand we assumed that one of the tasks pairs should be easier than the others, but on the other hand we need to rethink about the validity of the tasks.

Session Q 4

26 August 2021 09:00 - 10:00

Session Room 10

Single Paper

Developmental Aspects of Instruction, Motivational, Social and Affective Processes, Teaching and Teacher Education

Science Education

Keywords: Argumentation, Attitudes and Beliefs, Competencies, Content Analysis, Environmental Education, Experimental Studies, School Effectiveness, Science Education

Interest group: SIG 11 - Teaching and Teacher Education, SIG 13 - Moral and Democratic Education, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Max Scheja, Stockholm University, Sweden

Issue-based and Action-oriented Instruction for Future Citizens: The Impact of Scientific Knowledge

Keywords: Argumentation, Competencies, Environmental Education, Science Education

Presenting Author:Shih-Yeh Chen, Taichung Municipal Dali High School, Taiwan; **Co-Author:**Shiang-Yao Liu, National Taiwan Normal University, Taiwan

With the evolving complexity of the modern society, human beings confront the problems come from the environment and humanity, and some issues emerge when people articulate their arguments toward the issue occurred in authenticity. In this study, we integrate the competences of argumentation and action into the instruction of battery and energy to allow students to propose sound arguments and take informed actions. The relationship of the scientific knowledge and argumentation quality as well as the impact of the scientific knowledge on the authentic action are explored under the socioscientific issues concerning the utilization of the solar energy and the deterioration of the global warming respectively. Participants were 66 ninth graders in Taiwan. Analyses on the scientific knowledge and argumentation performance are conducted by correlation and regression analysis while the actions were categorized by content analysis to find out the role of scientific knowledge. Results show that the use of the scientific knowledge correlates with the argumentation quality. Further it also significantly predicts students' performance on argumentation at the pre- and post-test. Three years after the instruction, students' actions are categorized into the personal action, participatory action, leadership action, and preparing for action. Scientific knowledge is thought to be the way to comprehend the root causes of the problem, and the approaches as well as visions to solve the problem. Taking the elements of argumentation and action into the design of the science curriculum would benefit students' participation and contribution in this modern society.

Digitalization in the Mirror of Time of COVID 19. How does school principals' perception change?

Keywords: Attitudes and Beliefs, Content Analysis, School Effectiveness, Science Education

Presenting Author:Ulrike Krein, TU Kaiserslautern, Germany; **Co-Author:**Mandy Schiefer-Rohs, TU Kaiserslautern, Germany

Digitalization has already been discussed before the corona pandemic and has once again come to the fore, particularly, in the educational sector and in schools on site. Although the discussion about digital media in schools is not new, digitalization still poses numerous challenges for schools, which school principals are faced with as important key persons in schools. However, it is often unclear how school principals perceive these changes, how they position themselves in relation to these developments and what actions they are willing to take. This paper focuses on the analysis of interviews with school principals with regard to their understanding of digitalization in terms of their value attributions, attitudes and their own ideas about school and school development in times of digitalization before and during the COVID 19 pandemic.

Person- and Situation-Specific Factors in Discounting Science via Scientific Impotence Excuses

Keywords: Argumentation, Attitudes and Beliefs, Experimental Studies, Science Education

Presenting Author:Tom Rosman, Leibniz Institute for Psychology (ZPID), Germany; **Co-Author:**Martin Kerwer, Leibniz Institute for Psychology (ZPID), Germany; **Co-Author:**Anita Chasiotis, Leibniz-Institute for Psychology (ZPID), Germany; **Co-Author:**Oliver Wedderhoff, Leibniz Institute for Psychology (ZPID), Germany

Munro (2010) found that individuals, when confronted with belief-disconfirming scientific evidence, resist this information by concluding that the topic at hand is not amenable to scientific investigation – a scientific impotence excuse. We strived to replicate this finding and to extend this work by analyzing other factors that might lead to scientific impotence excuses. As a person-specific factor, we analyzed the role of epistemic beliefs, and as a situational factor, we focused on the contradictoriness of the evidence at hand. Three sets of hypotheses were preregistered. In an experimental 2x3 online study drawing on a general population sample of $N = 901$ participants, we first assessed our participants' prior beliefs on the effects of acupuncture versus massaging (pro acupuncture vs. no opinion). One experimental group then read fictitious empirical evidence claiming superiority of acupuncture, another group read evidence speaking against acupuncture, and a third group read conflicting evidence (i.e., a mix of pro- and contra-findings). Scientific impotence excuses were measured by a newly developed questionnaire. Our first hypothesis, which suggested that participants believing in the superiority of acupuncture would make stronger scientific impotence excuses when confronted with belief-disconfirming findings, was confirmed. A second hypothesis suggested that scientific impotence excuses would be stronger when individuals were confronted with evidence exhibiting a 'nature' that contradicts their topic-specific epistemic beliefs. This hypothesis was partially supported. A third hypothesis suggested that individuals confronted with conflicting evidence would make stronger scientific impotence excuses, and this was again confirmed. Implications for theory and practice are discussed.

Session Q 5

26 August 2021 09:00 - 10:00

Session Room 7

Single Paper

Teaching and Teacher Education

Teacher Professional Development

Keywords: Competencies, Culture, Social Aspects of Learning and Teaching, Teacher Effectiveness, Teacher Professional Development, Teaching/Instruction, Video Analysis

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Thorsten Scheiner, Australian Catholic University, Australia

Toward an embodied, cultural, and social view of teacher noticing

Keywords: Culture, Social Aspects of Learning and Teaching, Teacher Professional Development, Teaching/Instruction

Presenting Author:Thorsten Scheiner, Australian Catholic University, Australia

Teacher noticing has been widely understood as a kind of seeing or way of making sense of classroom events and instructional details. Such notions of teacher noticing often construe noticing as a disembodied, purely mental form of seeing and position the teacher as separated or separable from the observing environment. They rely on intuitive models that adopt the usual divide between mind, body, and matter, and that fuel the dualism between the individual and the environment. This paper attempts to work toward an embodied, cultural, and social view of teacher noticing. Teacher noticing, on such a proposal, includes culturally and historically constituted forms of framing classroom events, embodied ways of accessing and exploring the classroom world, and active shaping and interaction with the classroom setting's social and material structure.

New ways in video-based research: Exploring teachers' "professional vision" with eye-tracking

Keywords: Teacher Effectiveness, Teacher Professional Development, Teaching/Instruction, Video Analysis

Presenting Author:Corinne Wyss, FHNW School of Education, Switzerland; **Co-Author:**Katharina Rosenberger, University College for Teacher Education, Austria; **Co-Author:**Wolfgang Bührer, PH Zürich, Switzerland

Current research approaches about teacher professionalism focus, among other issues, on the concept of "professional vision" (Goodwin, 1994). To investigate this concept, the eye-tracking method could provide important new insights. However, there are not yet many studies on this issue. In the exploratory study presented here, 56 study participants (28 student teachers and, as a reference group, 28 university lecturers at a university of teacher education) were each shown a one-minute video clip of a real teaching situation in which a critical incident (cf. Tripp, 1993) can be observed. The viewing behavior of the participants while watching the video on a computer screen was recorded and the post-hoc think aloud verbalizations were audio-taped. Both eye-tracking data and verbalizations were analyzed.

The study examines the following overarching question: To what extent can differences, which point to "professional vision", between student teachers and university lecturers be identified when viewing a videotaped teaching scene containing a "critical incident"?

The results reveal differences between the two groups studied – both in eye tracking and in interview data. The statements of the university lecturers in the oral survey are generally more substantial and the critical incident was only explicitly mentioned by persons from this group. The eye-tracking analyses show that the viewing behavior of this group of university lecturers differs significantly from the other study participants with regard to the defined AOIs. The results substantiate those differences in "professional vision" between novices and experienced teaching relate to those in similar studies (e.g. Wolff et al., 2016).

Development of Constructivist Teaching Competences in Teacher Education: A Videobased Intervention

Keywords: Competencies, Teacher Professional Development, Teaching/Instruction, Video Analysis

Presenting Author:Mirjam Kocher, University of Education Zurich, Switzerland; **Co-Author:**Anna Locher, University of Education Brugg-Windisch (PH FHNW), Switzerland; **Co-Author:**Matthias Baer, University of Education Zurich (PHZH) and University of Zurich (UZH), Switzerland

How to promote teaching competences in teacher education is still a relatively un-researched field. The presentation first shed a light on some elected results from previous studies, which show that lessons of student and experienced teachers contain primarily direct instruction and rather low cognitive demand. Then results of a intervention study are presented. This study aims the promotion of constructivist ways of teaching instruction in teacher education with a video-based intervention. A central element of the intervention is the analyses of and the reflection on own lesson videos by student teachers and by experienced teachers. The study participants are student teachers of the Educational University of Zurich and experienced teachers, who are mainly involved in the training of the student teachers as mentors. The focus of the intervention is on the adaptive promotion of (1) the student teachers and (2) the experienced teachers by video lessons, which they taught in the subject German. Additionally data from control groups are recorded without intervention. The intervention is implemented in the regular schedule of the Educational University during three semesters. The effects of the intervention is investigated in a multiperspective way by eight data collection instruments over four measurement points. We will show results about the development of teaching competences (the development of teaching quality, subjective beliefs about instruction and personality aspects) within and between the intervention groups and the control groups.

Session Q 6

26 August 2021 09:00 - 10:00

Session Room 9

Single Paper

Assessment and Evaluation, Motivational, Social and Affective Processes

Motivation and Quantitative Methods

Keywords: Assessment Methods and Tools, Mathematics, Meta-analysis, Motivation, Primary Education, Quantitative Methods, Self-efficacy

Interest group: SIG 01 - Assessment and Evaluation, SIG 08 - Motivation and Emotion

Chairperson: Yuri Uesaka, The University of Tokyo, Japan

Explaining Interindividual Stability in Knowledge – A Meta-Analysis on the Role of Motivation

Keywords: Meta-analysis, Motivation, Quantitative Methods, Self-efficacy

Presenting Author:Thomas Simacek, University of Trier, Germany; **Co-Author:**Bianca Simonsmeier, University of Trier, Germany; **Co-Author:**Michael Schneider, University of Trier, Germany

It is a common misconception that correlations between prior knowledge and posttest knowledge address the importance of prior knowledge in learning new information. Instead, they reflect the interindividual stability of rank orders in knowledge scores. A possible explanation for stable patterns in groups of learners may be that prior knowledge poses a resource for motivation, which can in turn affect later learning outcomes. For this reason, motivational mediators were tested to account for the relation between prior knowledge and posttest knowledge in a meta-analysis. In particular, self-efficacy, self-concept, interest, and intrinsic motivation were considered as motivational constructs. The literature search provided 31 studies reporting 202 effect sizes. Significant mediation paths were found for self-efficacy ($rMED = .10$, 95% CI [0.03, 0.16]), self-concept ($rMED = .09$, 95% CI [0.06, 0.13]), and interest ($rMED = .03$, 95% CI [0, 0.06]), whereas the mediation path of intrinsic motivation ($rMED = .02$, 95% CI [-0.02, 0.05]) failed to become significant. Moderation analyses revealed that these findings remained stable across different instructional methods, contexts, and study methodologies. The results of the meta-analysis provide an explanation of interindividual stability in knowledge and stress the role of motivation as an underlying mechanism. However, motivation only partially explains the correlation between prior knowledge and posttest knowledge, which is why additional mediators are assumed to account for this relation.

Effects of Student-Teacher-Conferences on motivational aspects of learning

Keywords: Assessment Methods and Tools, Motivation, Primary Education, Quantitative Methods

Presenting Author:Sonja Ertl, Friedrich-Alexander Universität, Germany; **Co-Author:**Andreas Hartinger, Universität Augsburg, Germany; **Co-Author:**Benjamin Kücherer, Universität Augsburg, Germany

Student-Teacher-Conferences (German: Lernentwicklungsgespräche = LEG) are a form of performance feedback in which elements of formative assessment can be implemented. In order to clarify whether LEG – similar to formative assessment – also has positive effects on motivational aspects of learning, 392 children in grade 2 were interviewed in a pre-post design. The qualitative implementation of LEG was also taken into account. The results show that, from the children's point of view, LEG is implemented qualitatively well – however, there were clear differences between different classes. The results of hierarchical regressions show that LEG has positive effects on motivational aspects of learning, although this is dependent on qualitative implementation. The results will be discussed and further research desiderata identified.

Profiles of mathematical skills and motivation among first grade students

Keywords: Mathematics, Motivation, Primary Education, Quantitative Methods

Presenting Author:Heta Tuominen, University of Turku, Finland; **Co-Author:**Markku Niemivirta, University of Eastern Finland, Finland; **Co-Author:**Johan Korhonen, Åbo Akademi University, Finland; **Co-Author:**Anna Tapola, University of Helsinki, Finland; **Co-Author:**Riikka Mononen, University of Oslo, Norway

High self-concept and interest are often linked to good academic performance, but we still know fairly little about the interplay between individual differences in self-concept, interest, and math performance in young children. Following a person-oriented approach, the aim of this study was to investigate what kinds of profiles of mathematical skills and motivation can be identified among first-graders, and how students with different profiles differ with respect to math value and more general school value. The participants were 265 Norwegian first-graders ($M_{Age} = 6\text{ y }9\text{ mo}$; 45% girls), who completed various math tests (number sense, counting and arithmetic, and word problems) and a questionnaire assessing interest and self-concept in math, as well as math and school value. Using latent class clustering analysis, four distinct profiles were identified. The largest group (46%) consisted of students who displayed relatively high skills but slightly lower interest than on average. In addition, there was a group characterized by relatively high skills and positive motivation (22%) and, in contrast, a group with low skills and negative motivation (21%). Also, an interesting pattern of low skills but positive motivation was extracted (12%). ANOVAs showed that in addition to students characterized by high skills and positive motivation also students having positive motivation despite low skills displayed high valuing of math and school in general. The findings indicate that skills and motivation, especially interest, do not always go hand in hand. Some children might need support for math skills, some for motivation, and some for both.

Session Q 7

26 August 2021 09:00 - 10:00

Session Room 5

Single Paper

Higher Education, Teaching and Teacher Education

Quantitative Methods and Pre-service Teacher Education

Keywords: Competencies, Higher Education, Learning Analytics, Mathematics, Pre-service Teacher Education, Quantitative Methods

Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education

Chairperson: Jonas Emanuelsson, University of Gothenburg, Sweden

Empirical Relations between Communicative Skills, General Pedagogical Knowledge and Grades

Keywords: Competencies, Higher Education, Pre-service Teacher Education, Quantitative Methods

Presenting Author:Ulrike Schwabe, DZHW - German Centre for Research on Higher Education and Science Studies, Germany; **Presenting Author:**Kristina Walz, Justus-Liebig-Universität Giessen, Germany; **Co-Author:**Edith Braun, Justus-Liebig-Universität Giessen, Germany

The role of teacher's knowledge and professional competences has become an important topic within empirical educational research. Communication skills as well as general pedagogical knowledge (GPK) are seen as learning outcomes in higher education. Especially communication skills indicating performance can be interpreted as a transfer of learned skills to authentic situations in later professional life. Therefore, the empirical relationship between individual performance and acquired expert knowledge during studies is of special interest. In line to existing literature, our contribution aims to shed further light into the empirical relation between communication skills, GPK and grades attained in higher education. For this empirical investigation, we use data that were collected within the project "Performance-based assessment of student's communication skills" among students in teacher education in Germany. Our performance-based measures for communication skills can be theoretically and empirically distinguished into two types: strategic and understanding-oriented communication. Our results show that GPK significantly correlates with self-reported average grades, while communication skills do not. According to our assumptions both types of communication show a high correlations to each other, and can be best predicted by participants' age. However, duration in higher education institutions shows a mediocre correlation with some parts of communication as well as GPK. Based on our empirical findings, we conclude that life experience in general enhances communication skills as expected, while formal learning in higher education context(s) enhances GPK. Our results provide empirical knowledge that might be helpful (re)designing curricula in teacher education.

Sensitivity to diagnostic task potential: pre-service teachers task selection during diagnosis

Keywords: Competencies, Mathematics, Pre-service Teacher Education, Quantitative Methods

Presenting Author:Stephanie Kron, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Daniel Sommerhoff, Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Maike Achtner, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Christof Wecker, Universität Hildesheim, Germany; **Co-Author:**Matthias Siebeck, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Kathleen Stürmer, University of Tübingen, Germany; **Co-Author:**Stefan Ufer, Ludwig-Maximilians-Universität (LMU), Germany

Teaching adaptively requires teachers to observe and evaluate the learning of their students. Diagnostic competences allow teachers to make adaptive pedagogical decisions taking into account students' learning needs. In the context of mathematics education, the use of tasks for instruction, learning and assessment of student understanding is almost indispensable. As tasks vary in their structure and quality, they differ in their diagnostic potential, too. Diagnostic potential in this sense means, how likely the task is to elicit rich student responses and generate sufficient evidence to draw valid conclusions about student understanding. Although the importance of diagnostic competences of teachers, including a sensitivity to the diagnostic potential of tasks, is highlighted in research, there is a lack of findings regarding task selection in the context of educational diagnosis.

Addressing this gap, we report a study on mathematics pre-service teachers' task selection during simulated diagnostic one-on-one interviews. Assuming that pre-service teachers select tasks based on their diagnostic potential, we introduce the concept of sensitive task selection. Sensitivity to diagnostic task potential means the selection of a task caused on its diagnostic potential. Moreover, we analyzed the relatedness of task selection and different components of professional knowledge.

Findings show that pre-service teachers differ systematically in their sensitivity to diagnostic task potential. The study revealed, that especially content-related knowledge affected the selection of tasks and the sensitivity to diagnostic task potential. However, findings implicate that pre-service teacher education should provide support, helping pre-service teachers to acquire diagnostic competences.

Supporting preservice teachers' learning of quantitative research method with learning analytics.

Keywords: Higher Education, Learning Analytics, Pre-service Teacher Education, Quantitative Methods

Presenting Author:Erkko Sointu, University of Eastern Finland, Finland; **Co-Author:**Teemu Valtonen, University of Eastern Finland, Finland; **Co-Author:**Susanne Hallberg, University of Eastern Finland, Finland; **Co-Author:**Sanna Väistönen, University of Eastern Finland, Finland; **Co-Author:**Laura Hirsto, University of Eastern Finland, Finland

The purpose of this research is to investigate systematically implemented usage of learning analytics in a higher education quantitative research methods course targeted for preservice teacher. Quantitative research methods courses are typically experienced as challenging, even frightening among the target group. In order to provide more support for student teachers the possibilities of learning analytics were used. Based on recent studies learning analytics has proven to be an effective way to provide students with personal information of their learning processes. Also, studies focusing on learning analytics has shown that analytics provide teachers with valuable insight of the learning process that can be used for supporting students learning processes. The aim of this study is to understand students' self-regulation, time management, orientation for learning, anxiety, boredom, and enjoyment using the data collected with five measurement points during the course in addition to learning analytics data. Results indicate that learning analytics and scaffold provided important support for the student teachers' learning process. Particularly regulation and time management seem to develop positively and avoidance orientation decrease. Research indicates that strong planning for the use of learning analytics with scaffolding can support learning of challenging content in the preservice teacher education.

Session Q 8

26 August 2021 09:00 - 10:00

Session Room 1

Single Paper

Instructional Design, Learning and Special Education, Lifelong Learning

Self-regulation

Keywords: Case Studies, Content Analysis, Instructional Design, Motivation, Multimedia Learning, Self-efficacy, Self-regulation, Student Learning, Workplace Learning

Interest group: SIG 06 - Instructional Design, SIG 14 - Learning and Professional Development, SIG 27 - Online Measures of Learning Processes

Chairperson: Pia Naykki, University of Jyväskylä, Finland

Task or Self-Based Goals? A Goal-Setting Intervention Study within a Workplace SRL Training

Keywords: Instructional Design, Motivation, Self-regulation, Workplace Learning

Presenting Author:Anne Frieda Doris Kittel, Ulm University, Germany; **Co-Author:**Madita Dalpke, Ulm University, Germany; **Co-Author:**Sophia Rommel, Ulm University, Germany; **Co-Author:**Anita Christina Radi-Pentz, Ulm University, Germany; **Co-Author:**Tina Seufert, Ulm University, Germany

Recent developments like the digitalization lead to extensive changes, which professional development cannot sufficiently encounter. Thus, employees have a rising need to learn in a self-regulated way in order to be able to adapt to the required changes. Self-regulated learning (SRL) requires goal setting in order to plan, monitor and regulate to achieve the goal. Mastery-approach goals are favorable and can be further differentiated into task-based goals, i.e., achieving a task, and self-based goals, i.e., developing oneself. Because the SRL process aims at achieving goals, we investigate goal achievement of task-based and self-based goal-setting interventions within a digital SRL training as well as learning performance and strategy use with $N = 86$ employees. Two groups of randomized assigned participants received goal-setting interventions embedded in a longitudinal SRL training, which consisted of four modules. One group received a task-based goal at the beginning of the course and after two modules a self-based goal-setting intervention and vice versa in the other group. We measured goal achievement respectively in the proceeding training module. Results showed a higher learning performance and SRL strategy use after the training. Regarding goals, task-based goals were six times more likely achieved than self-based goals after one training module. However, after two training modules, there was no significant difference between the goal interventions. The results suggest that employees might accomplish task-based goals because they are used to them, whereas rather abstract self-based goals might need further SRL training to be effective at the workplace.

Nurses' self-regulated learning in the hospital: insights from a multi-perspective study

Keywords: Case Studies, Content Analysis, Self-regulation, Workplace Learning

Presenting Author:Katrien Cuyvers, Spaarne Gasthuis, Netherlands; **Co-Author:**Maaike Endedijk, University of Twente, Netherlands; **Co-Author:**Catharina Van Oostveen, Spaarne Gasthuis, Netherlands; **Co-Author:**Veerle Struben, Spaarne Gasthuis, Netherlands

Notwithstanding a growing interest in self-regulation of professional learning- for which we use the acronym "SRpL"- empirical research is still scarce. If studied, offline cross-sectional self-report techniques are used to measure SRpL retrospectively. A case study design was used, including 28 nurses from 6 different disciplines, their head nurses, and 11 learning counselors from the learning academy of the same hospital. Informed consent was obtained. A multi-method approach was applied. Observations offer evidence on overt SRpL-strategies of the nurses. Consecutively, observable behaviors were used as cues for immediate in-loco stimulated recall interviews, asking about metacognitive strategies and the content of thoughts regarding a situation at hand. Semi-structured interviews, guided by an interview protocol, were used to recall the use of SRpL-strategies of nurses by the head nurses and learning counselors. All fieldnotes and audiotaped interviews were transcribed verbally. The transcripts were analyzed with Nvivo 12 applying content analysis. Results show that nurses rather occasionally engage in SRpL-strategies to learn during job performance. Also, both head nurses and learning counselors indicate this occasional engagement. Offering patient-care comes to the fore in the indicated goals. However, overt and covert SRpL-strategies are found to originate in learning-goals now and then, initiating a subsequent learning process. However, strategies that advance and evaluate a potential learning process are more difficult to make explicit and extract from the data. The study contributes to the understanding of SRpL in everyday practice of nurses from multiple perspectives.

What's relationship between self-efficacy,self-regulation and performance in screen-based simulator?

Keywords: Multimedia Learning, Self-efficacy, Self-regulation, Student Learning

Presenting Author:Guillaume DECORMEILLE, Université Toulouse Jean-Jaurès, France; **Co-Author:**Thomas Geeraerts, Université Toulouse, France; **Co-Author:**Nathalie Huet, University of Toulouse 2, France

When students are learning with Screen-Based Simulator (SBS) they often use available learning helps in an unproductive way (Eleven et al., 2003). The ability to use help effectively depends on the learner's Self-Efficacy Beliefs (SEB) (Huet et al., 2016). The relevant use of help is regarded as an appropriate Self-Regulated Pattern (SRP) that enhances students' learning. Some of them do not seek help even though that help is available (Huet et al., 2011). A dependency relations between both SRP, SEB, and performance in tasks integrated into SBS was expected. We evaluated these relationships on a panel of 382 nursing students who learned on SBS in autonomy. Four SRP were identified according to the use of helps during the learning phases after error feedback and the choice of whether or not to train on the SBS. Results showed that low self-regulated students and middle self-regulators students showed a lower performance than the very high regulators who did not differ from the high regulators. No significant effect of SRP on the SEB was found. As expected, SEB was positively related to performance. However, the low amount of students in the very high regulator group calls for more incentives for students to train on the SBS in order to increase their performance.

Session Q 9

26 August 2021 09:00 - 10:00

Session Room 12

Single Paper

Motivational, Social and Affective Processes

Motivation

Keywords: Motivation, Quantitative Methods, Self-efficacy, Self-regulation, Social Aspects of Learning and Teaching, Social Interaction, Teaching Approaches

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Bernhard Schmitz, TU Darmstadt, Germany

Week-to-week interplay between teachers' motivating style and students' engagement

Keywords: Motivation, Quantitative Methods, Social Interaction, Teaching Approaches

Presenting Author:Aikaterini Michou, Bilkent University, Turkey; **Co-Author:**Athanasiou Mouratidis, Hacettepe University, Greece; **Co-Author:**Servet Atlan, Bilkent University, Turkey; **Co-Author:**Johnmarshall Reeve, Australian Catholic University, Australia; **Co-Author:**Lars-Erik Malmberg, University of Oxford, United Kingdom

Research has shown that teachers' autonomy support and provision of structure relate to students' agentic and behavioral engagement. Moreover, agentic engagement elicits higher teacher autonomy support. In the present 5-week diary study, we investigated the dynamic nature of this interplay between teachers and students through their cross-assessment of students' agentic and behavioral engagement. We also considered the week-to-week student-reported teacher autonomy support and provision of structure as well as three student personal characteristics— proactive personality, autonomous motivation, and controlled motivation. Two hundred forty-nine Turkish middle school students (52.2% females; Mage = 12.09 years; SD = 1.01) and their teachers from 13 classes participated in the study. Results from multilevel analyses showed that students' week-to-week perception of autonomy support as well as their initial level of autonomous motivation positively predicted teacher- and student-reported week-to-week agentic engagement. Students' perception of week-to-week provision of structure positively predicted only the student-reported week-to-week agentic and behavioral engagement. These findings indicate with a more rigorous methodology the dynamic interplay between students' situational engagement and teachers' situational motivating style (i.e., autonomy support and provision of structure) as well as the high predictive power of students' motivation but low predictive power of students' personality.

Students' lesson-to-lesson perceptions of the three basic dimensions of instructional quality

Keywords: Motivation, Quantitative Methods, Social Aspects of Learning and Teaching, Teaching Approaches

Presenting Author:Irma Talic, Bundeswehr University, Germany; **Co-Author:**Ronny Scherer, University of Oslo, Norway; **Co-Author:**Herb Marsh, Australian Catholic University, Australia; **Co-Author:**Samuel Greiff, Université du Luxembourg, Luxembourg; **Co-Author:**Jens Möller, Christian-Albrechts-Universität zu Kiel, Germany; **Co-Author:**Christoph Niepel, University of Luxembourg, Luxembourg

In the context of teaching evaluations as well as student learning and motivation, students' perceptions of instructional quality play an important role. However, within-student dynamics in these perceptions have been neglected thus far, even though states largely influence habitual perceptions. In the present study, we aimed to extend validity evidence on the three basic dimensions of instructional quality—teacher support, cognitive activation, and classroom management—to the within-person level, examining their factor structure and correlates. To this end, we conducted a three-week experience sampling study with N = 372 German secondary school students (Mage = 15.3 years) on their perceptions of instructional quality in each individual lesson in four subjects (i.e., up to 16 measurement points per subject in mathematics, physics, German, and English). The data were analyzed using two-level confirmatory factor analyses. We found substantial within-student variance (on average, 51 %) in perceptions of instructional quality. The hypothesized three-factor structure could be confirmed on both the within- and the between-student level across all subjects, and held against more parsimonious factor solutions. Positive relations to grades and academic interest were observed in both state and trait perceptions in similar strength. Our results indicate factorial and convergent validity of state student perceptions of instructional quality. Overall, our study sheds light on the structure and dynamics of these state perceptions in everyday school life, extends between-person derived knowledge to the within-person level, and thereby provides new possibilities for enhancing teaching effectiveness, student learning, and motivation.

Long-term Effects of a Learning Diary on Regulatory Processes: A Mixed-Methods Study

Keywords: Motivation, Self-efficacy, Self-regulation, Teaching Approaches

Presenting Author:Diana Pistoll, Medical School Hamburg, Germany; **Co-Author:**Thomas Martens, Medical School Hamburg, Germany

The present study explores the long-term effect of a specific learning diary on aspects of learning motivation and regulatory processes, by evaluating the data from a combined longitudinal and intervention study, as well as data from a follow-up assessment. In particular, the learning diary promotes self-reflection processes on learning methods and strategies that aim at the intention phase of the Integrated Model of Learning and Action (IMLA). A total of n = 157 7th and 8th grade pupils were examined at a district school in Northern Germany. Each week over a total period of six weeks, a learning method was tested and reflected upon using the learning diary. This reflection process was supported by short weekly one-on-one interviews. Pupils completed a pre- and post-questionnaire containing the most important constructs of the IMLA and a scale on social emotional support. Significant outcomes for self-efficacy and success experience, as well as social emotional support in the learning diary group in contrast to a control group were found. However, when tested a few months later, the identified effects did not appear to be stable over time. In a five month follow-up, a semi-structured interview was conducted with a total of n = 10 pupils. By implementing this mixed-method approach, further insight was obtained concerning the perceived social-emotional support, further determinants such as self-regulation, as well as providing information on why the expected long-term effects were not observed. Specifically, the lack of social support, as well as further differential effects concerning the ability to self-regulate, are being discussed.

Session Q 10

26 August 2021 09:00 - 10:00

Session Room 16

Single Paper

Higher Education, Motivational, Social and Affective Processes

Achievement and Motivation

Keywords: Achievement, Attitudes and Beliefs, Educational Psychology, Higher Education, Language (Foreign and Second), Motivation, Secondary Education, Survey Research

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion

Chairperson: Charalambos Charalambous, University of Cyprus, Cyprus

Only performance counts? Predicting university grades through prior performance & interest-major fit

Keywords: Achievement, Educational Psychology, Higher Education, Motivation

Presenting Author:Laura Messerer, University of Mannheim, Germany; **Co-Author:**Hanna Bürkle, University of Mannheim, Germany; **Co-Author:**Karina Karst, University of Mannheim, Germany; **Co-Author:**Stefan Janke, University of Mannheim, Germany

When selecting future students, universities usually aim to identify individuals that are most likely to perform well in the respective study program. Besides performance measures, measures of interest-major fit could be particularly helpful to identify such students as an optimal interest-major fit facilitates positive learning experiences and optimal motivation. However, there is a lack of longitudinal studies that investigate this assumed association between interest-major fit and academic performance as well as of measures that could be applicable for student selection purposes. Here, we aim to address both research gaps in a longitudinal study conducted in a sample of 418 German university students questioned at the beginning of their studies and after the end of their first academic year. In this study, we measured interest-major fit with a questionnaire that captures interest in a very subject-specific way and is low in its' abstraction level and can, thus, be answered by individuals who have little experience with their aspirated major (i.e., prospective students and freshmen). Regression analyses showed, that interest-major fit alone predicted university performance one year later, even when we accounted for high-school GPA. The findings indicate that, interest-major fit can be measured in a way that is understandable even for unexperienced freshmen and that this measure predicts later academic performance. These findings highlight that measures of interest-major fit might be helpful to university practitioners when selecting future students and for prospective students when aiming to find the ideal major.

Relationships among achievement motivation, grades, and aspirations: English as a foreign language

Keywords: Achievement, Language (Foreign and Second), Motivation, Survey Research

Presenting Author:Katerina Vlckova, Masaryk University, Czech Republic; **Co-Author:**Ondrej Papajoanu, Charles University in Prague, Faculty of Education, Czech Republic; **Co-Author:**Hana Vonkova, Charles University in Prague, Faculty of Education, Czech Republic

Achievement motivation in English as a foreign language became of great interest for teachers, parents, as well as researchers; as English became a common language for all developed countries. Empirical research in this area world-wide is quite rich. However, findings for Czech students are scarce. Our study uses logistic regression models to determine the relation between reported student achievement motivation measured by the need for achievement (Nfa) and the need to avoid failure (NtAF) and grades and aspirations to further study. The probability research sample consisted of 462 students at the end of their compulsory education in the Czech Republic (9th grade). Nfa was found to be a positive predictor and NtAF was a negative predictor of student final grade in English, receiving a final report card with honours, as well as aspiration to study at an elite upper secondary comprehensive school. The effect of Nfa on grades and aspiration was, on average, lower for males than for females. The effect of NtAF for males was, on average, higher. In our further research, we are preparing an application of the anchoring vignette method to cope with possible differences in scale usage among respondents and test if the relations will be stronger.

Science Expectancy and Values across Academic Tracks: Results from Dutch PISA 2006 and 2015

Keywords: Achievement, Attitudes and Beliefs, Motivation, Secondary Education

Presenting Author:Kate Xu, Open University of the Netherlands, Netherlands; **Co-Author:**Erik Roosken, Open Universiteit of the Netherlands, Netherlands; **Co-Author:**Renate de Groot, Open University of the Netherlands, Netherlands

Expectancy value theory proposes that expectancy of success and task values predict learner's academic achievement and career aspirations. While previous research has shown consistent support for the Expectancy value theory predictions, in particular for STEM domains, it is still relatively unknown whether these theoretical propositions are also applicable to students learning in different academic tracks. The practise of tracking, such as separating students into different educational streams based on academic ability, exists in many countries, including the Netherlands. The present study investigated the predictive effects of expectancy and values for science learning and aspirations for students in different academic tracks in the Netherlands. The samples are based on population representative samples of Dutch 15-year-old students participating in the OECD PISA from 2006 (n=4762) and 2015 (n=5128). Results revealed that intrinsic value and expectancy predicted science activities and achievement, whereas utility and intrinsic values predicted science aspirations. Furthermore, for students in lowest track, the VMBO track, both expectancy, value components, and their interactions are important factors positively associated with students' science activities. These findings are consistent with previous literature, extending the theory to a learning context cross academic tracks, and highlighted the importance of both expectancy and values for students in the VMBO track.

Session Q 11

26 August 2021 09:00 - 10:00

Session Room 11

Single Paper

Learning and Special Education, Motivational, Social and Affective Processes

Social Aspects of Learning and Teaching

Keywords: At-risk Students, Attitudes and Beliefs, Citizenship Education, Cultural Diversity in School, Experimental Studies, Motivation and Emotion, Multimedia Learning, Problem-based Learning, Social Aspects of Learning and Teaching

Interest group: SIG 08 - Motivation and Emotion, SIG 13 - Moral and Democratic Education, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Maximilian Knogler, Germany

Evaluating vs. Giving Feedback: Is Feedback Inflation Larger for Ethnic Minority Students?

Keywords: Cultural Diversity in School, Experimental Studies, Motivation and Emotion, Social Aspects of Learning and Teaching

Presenting Author: Anna K Nishen, Freie Universität Berlin, Germany; **Co-Author:** Ursula Kessels, Freie Universität Berlin, Germany

Feedback is central to learners in understanding how they can improve their performance as well as to their motivation (Müller & Ditton, 2014). In this inherently interpersonal situation, teachers may adjust their feedback compared to their initial evaluation to become more palatable and motivating by increasing positive content or by omitting negative content. However, the difference between evaluations and feedback may be greater for students belonging to negatively stereotyped groups. Regarding evaluations, prior research has established a persistent negative bias towards ethnic minority students in evaluations (Malouff & Thorsteinsson, 2016). In contrast, a positive bias in feedback has been demonstrated due to the feedback sender's concerns that criticism may reflect prejudice (e.g., Harber et al., 2012).

We tested these hypotheses using a 2 (migration background: Turkish vs. none;*within subjects*) x 2 (condition: evaluation vs. feedback;*between subjects*) design in a sample of 132 German teacher students. Participants evaluated/gave feedback on two low-quality essays, written supposedly by a student with a Turkish/no migration background. Participants in the feedback condition gave better grades, were more positive in their ratings, and included more positive comments than participants who evaluated the essays. Moreover, participants were more positive in their impressions of the Turkish-German student compared to the student without a migration background—unexpectedly, this was the case in both evaluations and feedback. Potential moderators of this positive feedback bias were examined. Implications of a positive bias in feedback in general and towards negatively stereotyped students are discussed.

Global Citizenship Education in the age of digital transformation. From theory to teaching practice

Keywords: Citizenship Education, Multimedia Learning, Problem-based Learning, Social Aspects of Learning and Teaching

Presenting Author: Ronald Tuschl, University of Graz/Department of Education Research and Teacher Education, Austria

In 2012, UN Secretary-General Ban Ki-Moon launched the Global Education First Initiative, which outlines the importance of Global Citizenship Education in schools. The term "Global Citizenship Education (GCED)" is defined as a form of teaching and learning that encourages learners to actively engage in projects that address global challenges that are social, political, economic or environmental in nature. A core dimension of Global Citizenship Education is the creation of global consciousness, which represents the ethical and moral dimension. This involves the development of critical and transformative perspectives, the awakening of global awareness ("worldmindedness"), and a holistic understanding of our world. Another core dimension is the so-called global competence, which represents the technical-rational dimension of GCED. In this context, the promotion of language competence, intercultural competence plays an essential role. Teaching principles and learning competencies include critical reading, writing, and analysis of global issues and competence in the use of new digital media. Furthermore, understanding the interrelationships of political decision-making processes at the local, national, regional, and global levels, networked thinking, and respect for diversity are also important. Ultimately, the lessons are also about ethical responsibility as well as commitment and democratic participation as global citizens. This includes compassion, empathy, collaboration, dialogue, active participation, and social entrepreneurship. This paper aims to present the framework of a five-year habilitation project at the University of Graz in Austria, contributing to the realization of GCED in compulsory education and higher education.

School differences in the degree to which students feel recognized by their teachers

Keywords: At-risk Students, Attitudes and Beliefs, Cultural Diversity in School, Social Aspects of Learning and Teaching

Presenting Author: Svenja Vieluf, German Institute for International Educational Research (DIPF), Germany; **Co-Author:** Nina Roczen, German Institute for International Educational Research (DIPF), Germany; **Co-Author:** Mojca Rožman, IEA, Germany; **Co-Author:** Ana Kozina, Pedagoški inštitut, Slovenia; **Co-Author:** Birgitte Lund Nielsen, VIA University College, Denmark; **Co-Author:** Saša Pužić, Intitute for Social Research Zagreb, Croatia; **Co-Author:** Christine Sälzer, University of Stuttgart, Germany; **Co-Author:** Maria Rasmusson, MIUN, Sweden

Based on Honneth's (1995) normative theory of recognition and Helsper's (2008) school culture theory, the paper aims at examining differences between schools in the degree to which students feel recognized by their teachers. The paper further aims at explaining these differences with teachers' awareness of societal inequalities as one aspect of the school culture. The sample consisted of 788 students and 335 teachers from 36 primary schools from three European school systems (Croatia, Slovenia, Sweden) who participated in the Erasmus + project "HAND in HAND: Social and Emotional Skills for Tolerant and Non-discriminative Societies (A Whole School Approach)". Based on students' responses to questionnaire scales measuring their experiences of recognition in schools as well as teachers' responses to a scale measuring their awareness for societal inequalities we carried out descriptive and correlational analysis at the school level. We found significant differences within and between schools in students' self-reported experience of recognition in schools. In some schools, teachers appear to treat students more respectful and more equal than in others. The former schools are further characterized by a higher awareness of inequalities among the teacher body. These findings suggest that critical reflection of the societal conditions framing schooling and teaching might be helpful for increasing the inclusiveness of education. Yet more research is needed to test this hypothesis.

Session Q 12

26 August 2021 09:00 - 10:00

Session Room 8

Single Paper

Instructional Design, Learning and Instructional Technology

Computer-supported Collaborative Learning

Keywords: Collaborative Learning, Computer-supported Collaborative Learning, Educational Technology, Experimental Studies, Higher Education, Informal Learning, Instructional Design, Problem Solving, Quantitative Methods

Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Pedro Leite da Silva, ISPA-Instituto Universitário, Portugal

Providing Information on Cognitive and Emotional Group Aspects in Social Media Learning Environments

Keywords: Computer-supported Collaborative Learning, Experimental Studies, Informal Learning, Instructional Design

Presenting Author: Lisa Ollesch, University of Duisburg-Essen, Germany; **Co-Author:** Daniel Bodemer, University of Duisburg-Essen, Germany

Abstract

Cognitive and emotional group awareness (GA) tools, which provide awareness information about intangible but beneficial cognitive and emotional aspects of collaborative learners, have different effects on social media or wiki processes and outcomes. Whereas cognitive GA information leads to positive effects on contribution quality; emotional GA information, even though neglected in this context, allows assumptions about increased emotionality of contributions. Moreover, social media learning platforms potentially benefit from combining cognitive and emotional GA. We assumed that emotional GA support can increase the effects of cognitive GA support on learning performance after wiki collaboration, as triggered cognitive and emotional processes are closely related to learning growth. Systematic approaches that investigate both single cognitive and emotional GA and their combination effects are missing. To close this research gap, we conducted a between-subject experiment ($N = 148$, four conditions), using quantitative measures, qualitative measures, and sentiment analysis. Participants were provided with a wiki-like environment (article page and talk page on drive technologies) and, except of the control condition, dynamic cognitive (knowledge score) and/or emotional (friendliness score) GA information. Our results showed that cognitive GA information has indeed positive effects on the quality of produced wiki content (on talk page and article page), whereas emotional GA information has positive effects on the friendliness level of contributions (on talk page). However, neither single cognitive GA support nor the combination of both types of GA support had a positive effect on resulting

learning performance. These results allow for conclusions about practice implementations and future studies.

Patterns of collaborative problem-solving processes in an online environment: A network approach

Keywords: Collaborative Learning, Computer-supported Collaborative Learning, Problem Solving, Quantitative Methods

Presenting Author: Shupin Li, University of Jyväskylä, Finland; **Co-Author:** Johanna Pöysä-Tarhonen, University of Jyväskylä, Finland; **Co-Author:** Päivi Häkkinen, University of Jyväskylä, Finland

Collaborative problem solving (CPS), comprising a complex set of social and cognitive skills, has recently received increasing attention since much of the work in the current knowledge society is conducted in teams. Yet, processes of online CPS tasks related to social and cognitive dimensions are not much studied. The present study examines the patterns in the processes of students' CPS assessment tasks in pairs and the relationship between the process patterns and students' social and cognitive skills. Altogether 166 Finnish students (Mean_{age}=12.60, SD_{age}=0.33, female=91, 54.82%) remotely participated in four tasks in pairs. Based on social and cognitive skill levels, five CPS paired configurations were identified: active high-performing, active compensated, active low-performing, compensated low-performing and passive low-performing pairs. We used weighted directed networks (nodes for movements and ties for changes of movements) to represent multiple movement sequences in participants' process data. For one of the tasks, we also calculated that number of existing nodes, density, degree centralization, reciprocity and numbers of 16 triadic patterns for each network representing CPS process of a pair of participants. Results showed that active high-performing pairs conducted the most number of movements while passive low-performing pairs attempted the least. Students who had cognitively higher skill levels changed more movements on average and they conducted certain movements more than other movements. The present study extends knowledge of individual CPS profiles into paired configurations. It also provides teachers with grounds to be aware of the students' previous successful CPS work when assigning them into pairs for CPS tasks.

Creating presence from a distance. Comparing remote and on-site group experiences.

Keywords: Computer-supported Collaborative Learning, Educational Technology, Higher Education, Problem Solving

Presenting Author: Annelies Raes, KU Leuven, Belgium; **Co-Author:** Jean Heutte, CIREL, Centre Interuniversitaire de Recherche en Education de Lille, Université de Lille, France

The last months, the global pandemic forced us to rethink education to fight COVID-19 and apply social distancing during lectures. Luckily, we could fall back on existing research on distance education in general, and on synchronous hybrid or multi-access education more specifically. During multi-access education both on-site and remote students are connected and are taught synchronously. Previous research focused on lectures in this setting, yet what is currently missing in the literature are empirical insights on group learning in this setting and this is what has been investigated in this study. As part of an iterative design-based research study started in 2017, in September 2020 teaching through collaborative problem solving has been studied in the context of the hybrid virtual classroom. The main research objective was to investigate the effect of physical or remote presence on both students' conceptual understanding and students' motivation and appreciations during learning. We did not find significant differences between remote and on-site students regarding conceptual understanding, yet differences were found regarding affective variables, including intrinsic motivation and relatedness. Nonetheless, remote students expressed to feel somewhat connected with their peers and the teacher thanks to the instructional design of the session. In future research we aim to further investigate how we can better capture the construct of relatedness which seems to be a crucial construct to promote optimal learning experience, yet less developed in current literature.

Session Q 13

26 August 2021 09:00 - 10:00

Session Room 13

Single Paper

Motivational, Social and Affective Processes

Attitudes, Beliefs and Motivation

Keywords: Assessment Methods and Tools, Attitudes and Beliefs, Educational Psychology, Motivation, Quantitative Methods, Values Education

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Sebastian Anselmann, University of Education Schwäbisch Gmünd, Germany

Examining Students' Expectancies and Values with Networks and Directed Acyclic Graphs

Keywords: Assessment Methods and Tools, Attitudes and Beliefs, Educational Psychology, Motivation

Presenting Author: Hye Rin Lee, University of California Irvine, United States; **Co-Author:** Daniela Alvarez-Vargas, University of California, Irvine, United States; **Co-Author:** Xin Tang, University of Helsinki, Finland; **Co-Author:** Drew H. Bailey, University of California, United States; **Co-Author:** Ji Seung Yang, University of Maryland, United States; **Co-Author:** Nayssan Safavian, University of California, Irvine, United States; **Co-Author:** Hanna Gaspard, TU Dortmund University, Germany; **Co-Author:** Sandra Simpkins, University of California, Irvine, United States; **Co-Author:** Katariina Salmela-Aro, Helsinki University, Finland; **Co-Author:** Jacquelynne S. Eccles, University of California, Irvine, United States; **Co-Author:** Allan Wigfield, University of Maryland, United States

Work that disentangles the interplay of constructs within Situated Expectancy-Value Theory (SEVT) will move the field closer to improving students' achievement through motivation. Prior evidence from correlational studies and interventions is sometimes ambiguous, because of the large number of hypothesized causal pathways among SEVT constructs and because most interventions plausibly affect multiple constructs. In the current study, we attempt to generate a set of models, against which prior and future results regarding the relations of individuals' expectancies and values can be compared. We conduct an exploratory path analysis using psychological network analysis to develop a set of directed acyclic graphs (DAGs), which represent theoretically plausible links between SEVT constructs (i.e., expectancies and subjective task values) and students' prior achievement in math using samples from three different datasets ($n = 1,540$, $1,867$, and 103) of students primarily in ninth grade in the U.S. and Germany. Results showed that—across data sets—prior achievement points to expectancy, intrinsic value points to expectancy, and utility value points to attainment value. These models are not meant to be definitive, but rather are presented to motivate future tests of causal relations among SEVT constructs with more causally informative designs such as experiments. We discuss ways that the language and tools of causal inference can help researchers better test theories about the co-development of SEVT constructs.

Networks of Expectancies-Values-Costs in Finnish Adolescents across Subjects, Years, and Achievement

Keywords: Assessment Methods and Tools, Attitudes and Beliefs, Motivation, Values Education

Presenting Author: Xin Tang, University of Helsinki, Finland; **Co-Author:** Katariina Salmela-Aro, Helsinki University, Finland

Situated Expectancy-Value Theory (SEVT; Eccles & Wigfield, 2020) has emphasized the holistic and dynamic nature of motivational processes in determining academic choice, behaviors, and outcomes. This study aimed to understand the intricate associations among expectancy, intrinsic value, attainment value, cost value, and achievement using network analysis in 2,000 Finnish adolescents ($N = 2,018$; 55.3% female). Moreover, those associations were examined across two subjects (i.e., Finnish and math) and over the course of four years (grade 6-9) to understand the stability and consistency. Results showed that although Finnish and Math networks were similar at sixth grade, they started to differ from seventh grade. Expectancy and interest were tied closely to achievement in math networks, whereas only expectancy was tied closely to achievement in Finnish networks. Finnish networks were rather stable across years. However, math networks varied from grade 7 to 9. Across all networks, expectancy was the closest motivation to achievement while utility was the furthest. Our findings indicated that SEVT networks are mostly subject-bounded and varied yearly; thus, subject domains and study years are contexts that situate SEVT in dynamic ways. Furthermore, the study implied that expectancy and interest may be the most desirable targets for motivation interventions instead of utility value.

The "situative nature" of expectancies and values and the predictive power of autonomy support

Keywords: Attitudes and Beliefs, Motivation, Quantitative Methods, Values Education

Presenting Author: Cora Parrisi, University of Tübingen, Germany; **Co-Author:** Hanna Gaspard, TU Dortmund University, Germany; **Co-Author:** Steffen

Zitzmann, University of Tübingen, Germany; **Co-Author:**Ulrich Trautwein, University of Tübingen, Germany; **Co-Author:**Benjamin Nagengast, Eberhard Karls Universität Tübingen, Germany

In their situated expectancy-value theory, Eccles and Wigfield (2020) assume students' expectancies and values to be situation-specific and thereby to be "situative" in nature. Even though motivation research has gradually been developing an understanding of this situative nature, for instance, by disentangling time-consistent and fluctuating proportions of expectancies and values at the analytical level of the individual, most studies still have not disentangled them at the class level. The present study sought to close this gap by applying a multilevel modeling approach based on data from 1,617 ninth-grade students in 78 classrooms across five consecutive math lessons. Our findings revealed significant proportions of trait variance and state residual variance in students' expectancies, values, and their perceptions of autonomy-supportive teaching behaviors at the individual and class levels. Larger amounts of variance could be attributed to the individual level compared with the class level and to fluctuating compared with time-consistent proportions (across levels). Furthermore, students' perceptions of autonomy-supportive teaching behaviors predicted their situation-specific expectancies and values, whereby time-consistent differences, both between students and between classes, explained more variance than fluctuations within students and within classes. Thus, our findings supported the situative nature of expectancies and values but also revealed that, by and large, time-consistent differences in the perceptions of autonomy-supportive teaching behaviors between students and classes had more predictive power for students' expectancies and values than intraindividual and intra-class fluctuations over time.

Session Q 14

26 August 2021 09:00 - 10:00

Session Room 17

Single Paper

Instructional Design, Motivational, Social and Affective Processes

History in Secondary Education

Keywords: Experimental Studies, History, Instructional Design, Mixed-method Research, Motivation, Quantitative Methods, Secondary Education, Student Learning

Interest group: SIG 06 - Instructional Design, SIG 11 - Teaching and Teacher Education

Chairperson: Tobias Feldhoff, Johannes Gutenberg University of Mainz, Germany

Developing a standardized questionnaire to assess the learning experience with eyewitness accounts

Keywords: Experimental Studies, History, Secondary Education, Student Learning

Presenting Author:Lisa Zachrich, University of Tübingen, Germany; **Co-Author:**Christiane Bertram, University of Konstanz, Germany; **Co-Author:**Ulrich Trautwein, University of Tübingen, Germany; **Co-Author:**Wolfgang Wagner, University of Tuebingen, Germany

History is about learning with and from intermediaries. A recent intervention study on the effects of learning with eyewitnesses of the past on students' competencies in the history classroom (Bertram et al., 2017) found that students tended to have more fun but are less critical when learning with eyewitnesses in person as compared to video or text versions. Aim of the current study was to develop a standardized assessment tool to investigate the mediating role of the learning experience on historical competencies in future intervention studies. The model on encountering complex historical sources describes how a learner deeply engages with a source (Zachrich et al., 2020), and served as a starting point to generate items that we either self-developed or adapted from existing questionnaires. In the validation study, 668 students ($M = 16.1$ years) filled out the questionnaire (87 items). We used an exploratory approach to find well-fitting factor models with simple structure loading patterns (independent cluster method) as typically applied in standard confirmatory factor analyses. The identified models that fit the data best matched well with the theoretically assumed structure. In total, 29 items (eight constructs) measure the experience of overwhelming immediacy. Cronbach's Alphas of the final scales ranged from $.78 < \alpha < .87$. The scales showed positive correlations with the perceived authenticity of the report and a negative correlation to insights into epistemological principles of history. The results attest to the psychometric qualities of the instrument.

Images of the past: the historical plausibility of students' written texts, drawings and film clips

Keywords: History, Instructional Design, Mixed-method Research, Secondary Education

Presenting Author:Tessa de Leur, Amsterdam University of Applied Sciences (AUAS), Netherlands; **Co-Author:**Carla Van Boxtel, University of Amsterdam, Netherlands

Creating a concrete image of the past can help students in secondary history education to understand past situations and developments. These images can be produced in written form, but more creative products such as drawings or role play are also possible. However, evaluating the historical plausibility of these images of the past is a difficult matter. This paper presents an approach to evaluate the historical plausibility of students' images of the past. This approach was grounded in three empirical studies in which we investigated 14-15 year-old students' images of the past in the context of a writing, drawing and drama task. We found that the historical plausibility of written products and drawings were reasonably well, albeit in a simple source-based task. We also found that students who are invited to discuss their drawings and drama products reveal additional information on how they imagine the past.

Students' motivation to learn history: A self-determination theory perspective

Keywords: History, Motivation, Quantitative Methods, Secondary Education

Presenting Author:Michiel Voet, Ghent University, Belgium; **Co-Author:**Robbe Brisard, Hogeschool Gent, Belgium; **Co-Author:**Bram De Wever, Ghent University, Belgium

This study sheds a new light on students' motivation to learn history, a topic that has so far received little attention in research on history education. The study does so by drawing on the well-established self-determination theory of motivation. Data for the study were gathered through a questionnaire that was completed by 465 students in second grade of secondary school (average age: 14 years old). A latent profile analysis of the data suggests that students can be grouped into 4 distinct motivational profiles, with different levels of autonomous and controlled motivation. Multilevel regression analysis further shows that students' autonomous motivation to learn history is positively affected by need-supportive teacher behavior and engagement with history outside of school, and negatively affected by need-thwarting teacher behavior. In contrast, controlled motivation is positively related to need-thwarting teacher behavior.

Session Q 15

26 August 2021 09:00 - 10:00

Session Room 14

Espresso Invited Symposium

Higher Education

SIG 4: Enhancing support in the transition to Higher Education – in the light of students' diversity

Keywords: Achievement, At-risk Students, Attitudes and Beliefs, Educational Attainment, Goal Orientation, Higher Education, Language (Foreign and Second), Self-efficacy

Interest group: SIG 04 - Higher Education

Chairperson: Mikaël De Clercq, Belgium

Discussant: Taiga Brahm, University of Tübingen, Germany

Transition to higher education (HE) is a crucial phase which can challenge students regarding social, motivational, content-related and organizational aspects when adjusting to the requirements of the new academic environment. A vast body of research tackles this issue and identified several factors playing a major role in successful transition. Yet, most existing research investigated the influence of these factors without considering the important heterogeneity of students'

body. More precisely, how these diverse students can be supported in the transition was insufficiently addressed in previous studies. To fill this research gap, this symposium aims at expanding our understanding of how to support students in their transition to HE by putting student's diversity at the core of the investigation. To do so, the first presentation will focus on the specific requirements experienced by diverse profiles of first year students and how these requirements are connected to student's academic achievement. The second presentation anchors the question of diversity in the distance setting implied by the COVID-19 pandemic. It will investigate the effects of a self-efficacy intervention on different groups of first year students distinguished by their background characteristics. The third presentation will propose a broader picture of diversity by analysing the institutional policies undertaken by two countries in order to facilitate the adjustment of migrant students as a minority group. The discussant will integrate these complementary perspectives on transition to HE and initiate a discussion on the nature of students' diversity and future perspectives in research.

Fair Enough?! Investigating the Specific Challenges of Diverse University First-Year Students

Presenting Author:Mikaël De Clercq, Université catholique de Louvain (UCL); Académie de Recherche et de l'Enseignement Supérieur (ARES), Belgium; **Co-Author:**Michaël Parmentier, Université Catholique de Louvain (UCL), Belgium; **Co-Author:**Florence Van Meenen, UCLouvain, Belgium

The transition into higher education (HE) is a particularly challenging process for students due to a large variety of difficulties and requirements. Moreover, increasing student numbers and diversity in European HE have complexified the issue of the successful transition to university. Consequently, it is important to further develop our understanding of factors that can contribute to successful and less stressful transitions into higher education for a diverse student body. This paper contributes to this scientific endeavour. More precisely, a study carried out among 1,048 first year students. Using latent profile analysis, our results yielded five profiles representing different combinations of achievement predictors (high school grade, socioeconomic status, informed-choice, and self-efficacy beliefs). When comparing the profiles, our results further highlighted key differences in the way students experienced the specific challenges associated with the transition and succeeded at the end of the first year. The discussion of the results allowed us to provide practical implication and future perspective on the thorny issue of diversity into the transition to HE.

Developing first-year students' academic self-efficacy in a distance setting

Presenting Author:Ronja Büker, Paderborn University, Germany; **Co-Author:**Juliane Füge, Universität Paderborn, Germany; **Co-Author:**Tobias Jenert, Universität Paderborn, Germany

Starting with the summer term of 2020, most Higher Education programmes in Germany could only be offered in online distance settings because of the Coronavirus pandemic. For some students, this situation can be problematic for technical reasons or psychosocial phenomena such as feelings of social isolation. Resulting from the limited opportunities for social integration during the Coronavirus pandemic, first-year students in particular need to be supported in coping with the challenges of transition to Higher Education. Self-efficacy is an important personal resource that helps to manage subjective stress and to deal with challenges that arise from a situation such as distance learning. We present an intervention study investigating the impact of an intervention to increase self-efficacy in a distance setting. The intervention aims to increase students' self-efficacy regarding challenging situations, particularly exams. We will analyse the effects of the intervention on different groups of students distinguished by characteristics such as familial background. Furthermore, we analyse whether students' perception of the intervention context, a peer-mentoring program, influences the intervention's effectiveness. In addition, possible correlations regarding personal resources and the perception of social relationships among the students will be considered. Moreover, the results of the study will help to identify differences in the development of predefined subgroups based on socio-demographic data.

Transitions in Higher Education for migrant students: Academic Language support in Italy and Sweden

Presenting Author:Giulia Messina Dahlberg, University of Gothenburg, Sweden; **Co-Author:**Sylvi Vigmo, University of Gothenburg, Sweden; **Co-Author:**Alessio Surian, University of Padova, Italy

The aim of this study is to shed light on the ways in which transitions and support are framed in policy contexts in relation to access to academic language in higher education (HE) in Sweden and Italy. More specifically, this study investigates the ways in which the discourse about the transition of migrant students in HE is framed in relation to the kinds of support offered to this group in two higher educational institutions, in Sweden and Italy. Furthermore, the study sheds light on the ways in which policy ideas about transition and access to legitimate language practices are enmeshed in the students' narratives and how they affect their experiences of participation, normalization and marginalization in HE. The analysis includes two datasets: i) national policy, laws and regulations and webpages of a selection of national universities and university colleges; and ii) ethnographically generated data that builds upon a case-study design and consists of audio recordings of informal discussions and interviews with students. In this study we are interested in framing diversity in terms of a move beyond the naturalization of hegemonic stances where labelled "Others" (e.g. based on cultural/ethnic background, functionality, socio-economic status) are treated as essentialized or mutually exclusive categories. The results show the mismatch between the range of support provided, and the actual needs and challenges that migrant students face in their transition and participation to higher education in two European countries.

Session Q 16

26 August 2021 09:00 - 10:00

Session Room 15

Sponsored Session

Proctorio

Keywords: Artificial Intelligence, E-Learning/Online Learning, Instructional Design, Lifelong Learning

Interest group:

The first and only Proctorio's Learning Integrity Platform is the only monitoring solution of its kind, combining machine learning and advanced facial detection technologies to remove human error and bias. By automating proctoring and originality verification, we ensure the integrity and value of distance learning and online certifications and degrees.

The difference is our experience instructional designers, lifelong learners, and former faculty members lead our company and develop our products, which is evident in every facet of our software and customer support. Proctorio's Learning Integrity Platform is unique because its design places stakeholders at the center, with engineers and designers addressing human concerns throughout the development process. We understand academic integrity and are working everyday to expand educational opportunities throughout the world.

A proven track record Already in the digital classrooms of over 1000 institutions, serving over 2 million weekly test-takers, Proctorio demonstrably works. We ensure fairness for distance learners by increasing accountability, securing exam content, and promoting a culture of integrity while improving learning outcomes.

Proctorio

Presenting Author:Markus Schwab, Proctorio GmbH, Germany; **Presenting Author:**Melvin van Groeningen, Proctorio, Netherlands

The first and only Proctorio's Learning Integrity Platform is the only monitoring solution of its kind, combining machine learning and advanced facial detection technologies to remove human error and bias. By automating proctoring and originality verification, we ensure the integrity and value of distance learning and online certifications and degrees.

The difference is our experience instructional designers, lifelong learners, and former faculty members lead our company and develop our products, which is evident in every facet of our software and customer support. Proctorio's Learning Integrity Platform is unique because its design places stakeholders at the center, with engineers and designers addressing human concerns throughout the development process. We understand academic integrity and are working everyday to expand educational opportunities throughout the world.

A proven track record Already in the digital classrooms of over 1000 institutions, serving over 2 million weekly test-takers, Proctorio demonstrably works. We ensure fairness for distance learners by increasing accountability, securing exam content, and promoting a culture of integrity while improving learning outcomes.

Session Q 17

26 August 2021 09:00 - 10:00

Session Room 4

Invited Symposium

Teaching and Teacher Education

SIG 20: Engaging Teachers in Inquiry Learning

Keywords: Educational Technology, In-service Teacher Education, Inquiry Learning, Instructional Design, Pre-service Teacher Education, Science Education

Interest group: SIG 20 - Inquiry Learning

Chairperson: Koen Veermans, University of Turku, Finland

Organiser: Wouter R. van Joolingen, Utrecht University, Netherlands

Discussant: Margus Pedaste, University of Tartu, Estonia

Virtual and Augmented Reality (VAR) and simulations have always held great promise for education. Despite potential and effectiveness, VAR and simulations have yet to become a natural ingredient in most classrooms. The current pandemic has created an immediate need for online alternatives for in class teaching for instance as an alternative for laboratory work. While this is likely to increase the uptake of technology enhanced inquiry learning, it also bears the risk that these immediate transitions from classroom to online fall short in terms of appreciating and paying attention to the role of the teacher in this transition. This symposium brings together four papers that can be aligned on two broad dimensions. The first is the distinction between pre- and in-service teachers, where the first emphasizes preparing future teachers for adopting technology enhance inquiry learning in their later professional careers, whereas the second emphasizes the integration into existing practices of professionals, the second the distinction between design and implementation. Collectively, the papers present different views on how pre-and in-service teachers can be engaged in pedagogically driven design and implementation of learning environments. Through their different approaches they provide insights into important considerations for designers of learning environments, teacher educators and teachers. The aim of the symposium is to disseminate these insights to the audience, but also use the time, space and expertise of the audience to discuss the implications of the papers in this symposium for teacher pre- and in-service training and for in class and online implementations.

Examining pre-service teachers' capability to design simulation based inquiry learning activities

Presenting Author:Tasos Hovardas, University of Cyprus, Cyprus; **Co-Author:**Marios Papaevripidou, University of Cyprus, Cyprus; **Co-Author:**Nikoletta Xenofontos, University of Cyprus, Cyprus; **Co-Author:**Zacharias Zacharia, University of Cyprus, Cyprus

In this study, we aimed at examining pre-service teachers' design of inquiry learning activity sequences (i.e., Inquiry Learning Spaces or ILSs). The ILSs were developed in the context of the Go-Lab ecosystem. Teacher training included presentation and familiarization with the Go-Lab ecosystem, and inspection and elaboration on a pilot ILS. As part of the requirements of two undergraduate university courses, pre-service teachers were asked to develop their own ILS in a context aligned with the national curriculum during the course and to transform a lesson plan into an ILS as part of the final exam for the courses. The ILSs were assessed using a list of criteria developed for the purposes of this study. The results draw comparisons between the ILSs, which in turn have practical implications for training pre-service teachers who will be designing and implementing computer-supported inquiry learning activities.

A Lesson Study approach to the development of an augmented reality for biology teaching

Presenting Author:Wouter R. van Joolingen, Utrecht University, Netherlands; **Co-Author:**Sui Lin Goei, Windesheim University of Applied Sciences, Netherlands; **Co-Author:**Henry Matimba, Freudenthal Institute, Utrecht University, Netherlands; **Co-Author:**Ryan Kyaw Thu Aung Ba, Nanyang Technological University, Singapore, Singapore

In this presentation we report on the development and evaluation of an augmented reality (AR) app for teaching the working of enzymes. The aim of the study presented was to investigate how teachers and developers can work together in creating technology for education, in this case AR for teaching biology. In the project four teachers participated in a Lesson Study (LS) team with educators and developers of teacher training institutes and a professionals specializing in creating applications for virtual and augmented reality. We report on the process of development, the resulting app and lessons as well as on the first experiences in the classroom. The main conclusion on the process concern the integration between lesson design and app development. Basic preparations on acquainting teachers with the use of AR and its content need to be made before starting the design and development cycle. Regarding the app itself, we identified improvements on the way AR can be a more integrated part of the learning activities.

Bringing simulations to the classroom: teachers' perspectives

Presenting Author:Tomi Jaakkola, Tampere University, Finland; **Co-Author:**Koen Veermans, University of Turku, Finland

The potential value of simulations in education has been argued already for many years, with the arguments often referring to learning, motivation, or both. This study is an extension of a series of empirical studies with students in controlled research settings. These studies show positive effects of the simulation environment (electric circuits) both in terms learning outcomes and interest. The present study shifts the focus from students to teachers. Participants were nine Finnish elementary school teachers that implemented the simulation in their classroom and reflected on their and their students' experiences. For most teachers this was a positive experience, but the results also reveal useful pointers and areas of improvement to take into consideration when thinking about bringing simulations to the classroom.

Guiding student thinking through teacher questioning when learning with dynamic representations

Presenting Author:Antti Lehtinen, University of Jyväskylä, Finland; **Co-Author:**Markus Hähtiöniemi, University of Jyväskylä, Finland; **Co-Author:**Pasi Nieminen, University of Jyväskylä, Finland

This study focuses on how pre-service teachers (PSTs) use questions to guide students who are learning with dynamic representations through inquiry and how questions are used to both structure and problematize students' actions. Data comes from science lessons taught by primary PSTs and mathematics lessons taught by mathematics PSTs. The analysis focuses on the different question types the PSTs used as well as how their questioning was adapted to students' situation. The results show examples on how the PSTs used questions both to structure student thinking and to problematize their answers and reasoning. Questioning was not always adapted to the students' needs. We propose that adapting questioning to student thinking requires a balance between structuring and problematizing and high-level of interpretation from the teacher.

Keynotes III 1

26 August 2021 10:45 - 11:45

Auditorium B

EARLI Keynote Session

The vital, though challenging nature of self-regulated learning more than ever acknowledged

Keywords: Collaborative Learning, Cooperative/Collaborative Learning, Early Childhood Education, Self-regulation

Interest group:

Chairperson: Ilse Hakvoort, Göteborg University, Sweden

In our rapidly changing, globalised knowledge society, education faces the challenge of preparing children and youngsters for tomorrow's society. Obviously, education must prepare learners for their role as engaged, critical citizens and as employees or entrepreneurs in the professional field. Additionally and in view of this, education should foremost enable students to develop into active, self-regulated learners, taking responsibility for their learning and developing a positive attitude towards lifelong learning. In this respect, it needs no further explanation why self-regulated learning (SRL) received increasing attention in educational research and practice. Unfortunately, however, research consistently revealed large interpersonal differences with a significant number of students facing

persistent SRL difficulties. Notwithstanding these disappointing findings, research convincingly reported positive news as well, with teachers and schools playing a leading role in being able to turn the tide. Simultaneously, however, effectively supporting students' SRL appears challenging and teachers often struggle with adequate SRL implementation. With this knowledge we entered 2020, "*and all at once, summer collapsed into fall*". With the new decade, the Covid-19 pandemic came, changing education in all respects. Students, parents, teachers, and schools worldwide were challenged. Teachers switched to virtual classrooms, parents balanced home schooling and their own jobs, and students switched to distance learning. Learning was under more pressure than ever. Self-regulated learning was expected from all students and the shortcomings and differences between learners became very tangible and sharper than ever. It confronts us, as SRL researchers, with the task of addressing urgent challenges; it urges us to look forward from a different reality and altered needs. After all, "*life starts all over again when it gets crisp in the fall*". In this respect, the keynote will aim at positioning challenges in the field and at reflecting on potential avenues for future SRL research and practice. The talk will consider methodological challenges, focusing among other things on the relevance of uncovering individual differences via person-centred and process-oriented approaches. Further, theoretically, the tangent field between self and socially shared regulation and the opportunities of collaborative (digital) learning environments as stepping stones to self-regulation will be considered. Third, reflecting on the different speeds at which SRL and SRL implementation research develops, pathways for (research on) teachers' and schools' professional learning in view of early SRL promotion for all students will be discussed.

The vital, though challenging nature of self-regulated learning more than ever acknowledged

Presenting Author:Hilde Van Keer, Ghent University, Belgium

In our rapidly changing, globalised knowledge society, education faces the challenge of preparing children and youngsters for tomorrow's society. Obviously, education must prepare learners for their role as engaged, critical citizens and as employees or entrepreneurs in the professional field. Additionally and in view of this, education should foremost enable students to develop into active, self-regulated learners, taking responsibility for their learning and developing a positive attitude towards lifelong learning. In this respect, it needs no further explanation why self-regulated learning (SRL) received increasing attention in educational research and practice. Unfortunately, however, research consistently revealed large interpersonal differences with a significant number of students facing persistent SRL difficulties. Notwithstanding these disappointing findings, research convincingly reported positive news as well, with teachers and schools playing a leading role in being able to turn the tide. Simultaneously, however, effectively supporting students' SRL appears challenging and teachers often struggle with adequate SRL implementation. With this knowledge we entered 2020, "*and all at once, summer collapsed into fall*". With the new decade, the Covid-19 pandemic came, changing education in all respects. Students, parents, teachers, and schools worldwide were challenged. Teachers switched to virtual classrooms, parents balanced home schooling and their own jobs, and students switched to distance learning. Learning was under more pressure than ever. Self-regulated learning was expected from all students and the shortcomings and differences between learners became very tangible and sharper than ever. It confronts us, as SRL researchers, with the task of addressing urgent challenges; it urges us to look forward from a different reality and altered needs. After all, "*life starts all over again when it gets crisp in the fall*". In this respect, the keynote will aim at positioning challenges in the field and at reflecting on potential avenues for future SRL research and practice. The talk will consider methodological challenges, focusing among other things on the relevance of uncovering individual differences via person-centred and process-oriented approaches. Further, theoretically, the tangent field between self and socially shared regulation and the opportunities of collaborative (digital) learning environments as stepping stones to self-regulation will be considered. Third, reflecting on the different speeds at which SRL and SRL implementation research develops, pathways for (research on) teachers' and schools' professional learning in view of early SRL promotion for all students will be discussed.

Keynotes III 2

26 August 2021 10:45 - 11:45

Auditorium A

EARLI Keynote Session

A Practical Theory of Teaching

Keywords: Instructional Design, Synergies between Learning; Teaching and Research, Teaching Approaches, Teaching/Instruction

Interest group:

Chairperson: Jonas Emanuelsson, University of Gothenburg, Sweden

Kurt Lewin once said, "There is nothing as practical as a good theory." How practical can a theory of teaching be? Can theories of teaching guide practice? Could a theory be developed that is useable by teachers? The challenge is to build a theory that does not ignore the complexity and systemic nature of classroom teaching while still focusing on those elements that directly affect the instructional decisions teachers make every day. A promising approach is to change what is commonly foregrounded in theories of teaching by combining what is currently known from research on learning and teaching with what could become the usual practices of classroom teachers. Because research shows that the nature of learning opportunities is more predictive of student learning than particular teaching moves, the theory could focus on the creation of learning opportunities rather than the deployment of particular teaching methods. Because theories, in general, are not designed to guide in-the-moment decisions but rather pose hypotheses that can be tested with planned activity, useable theories of teaching might require that the usual practice of teaching take planning and reflecting as seriously as performing. Finally, because theories are developed and improved by continually testing and refining the hypotheses about classroom practices that compose them, teachers must play a leading role in building, not just using, theories of teaching. Unpacking and tracing the consequences of these changes could reveal the feasibility and the potential of a practical theory of teaching.

A Practical Theory of Teaching

Presenting Author:James Hiebert, University of Delaware, United States

Kurt Lewin once said, "There is nothing as practical as a good theory." How practical can a theory of teaching be? Can theories of teaching guide practice? Could a theory be developed that is useable by teachers? The challenge is to build a theory that does not ignore the complexity and systemic nature of classroom teaching while still focusing on those elements that directly affect the instructional decisions teachers make every day. A promising approach is to change what is commonly foregrounded in theories of teaching by combining what is currently known from research on learning and teaching with what could become the usual practices of classroom teachers. Because research shows that the nature of learning opportunities is more predictive of student learning than particular teaching moves, the theory could focus on the creation of learning opportunities rather than the deployment of particular teaching methods. Because theories, in general, are not designed to guide in-the-moment decisions but rather pose hypotheses that can be tested with planned activity, useable theories of teaching might require that the usual practice of teaching take planning and reflecting as seriously as performing. Finally, because theories are developed and improved by continually testing and refining the hypotheses about classroom practices that compose them, teachers must play a leading role in building, not just using, theories of teaching. Unpacking and tracing the consequences of these changes could reveal the feasibility and the potential of a practical theory of teaching.

Session R 1

26 August 2021 12:00 - 13:00

Session Room 8

Single Paper

Cognitive Science, Learning and Instructional Technology, Teaching and Teacher Education

Computer-assisted Learning

Keywords: Comprehension of Text and Graphics, Computer-assisted Learning, Learning Disabilities, Learning Technologies, Metacognition, Reading Comprehension, Teacher Effectiveness, Teacher Professional Development

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 23 - Educational Evaluation, Accountability and School Improvement (merged with SIG 18), SIG 27 - Online Measures of Learning Processes

Chairperson: Sebastian Wurster, Johannes Gutenberg University Mainz, Germany

Impact of audio-support on reading strategy, time, and performance in students with dyslexia

Keywords: Comprehension of Text and Graphics, Computer-assisted Learning, Learning Disabilities, Reading Comprehension

Presenting Author: Carolien A. N. Knoop-van Campen, Radboud University Nijmegen, Netherlands; **Co-Author:** Danique ter Doest, Radboud University, Netherlands; **Co-Author:** Ludo Verhoeven, Radboud University Nijmegen, Netherlands; **Co-Author:** Eliane Segers, Radboud University Nijmegen, Netherlands

The use of adequate reading strategies is important to read efficiently. Students with dyslexia, not only read slower and less accurately, they also use fewer reading strategies. To compensate for their reading problems, they often receive audio-support via narration of the written text. However, audio-support linearly guides readers from beginning to end through a text, possibly hindering the use of reading strategies, and negatively impacting reading time and comprehension. Therefore, we examined to what extent audio-support in reading comprehension affects reading strategies, times and performance in 21 secondary school students with dyslexia and 22 typically developing controls. Participants were provided with three types of assignments (summarizing, open-ended questions, statement questions) in each condition (written text with and without audio-support). A SMI RED-500 eye-tracker captured eye-movements during reading. The standard deviation of the weighted fixation duration times of the text-AOs was considered indicative of the disparity of readers' attention within the text. Based on an experts' cut-off point and hand-coded validation, these scores visualized whether students used the intensive reading strategy (reading whole text) or selective reading strategy (focusing on part of the text). In open-ended assignments students with dyslexia divided their attention more over the whole text instead of focusing on one specific part when audio was added. In addition, audio-support increased reading time in students with and without dyslexia in most tasks, while in neither of the task's audio-support affected performance. It is concluded that audio-support impacts reading strategy in students with dyslexia and reading time in all students.

How do Teachers make Sense of Formative Assessments and how can they be supported by Visualizations?

Keywords: Comprehension of Text and Graphics, Computer-assisted Learning, Teacher Effectiveness, Teacher Professional Development

Presenting Author: Sarah Bez, University of Tuebingen, Germany; **Co-Author:** Samuel Merk, University of Education Karlsruhe, Germany

Computer-based formative assessment systems have the potential to enhance student learning and to support teachers by providing high-quality measures of competence levels and making learning progress visible. However, the success of this process in practice highly depends on teachers' data literacy, especially on their adequate perception and interpretation of the results. Against this background, this contribution investigates first, how teachers interpret results of computer-based formative assessments and second, how they can be supported in doing so by innovative visualizations. In the first exploratory part of the study, ecological valid think-aloud interviews with in-service teachers were conducted while these teachers interpreted assessment results of their students. Statistical analyses of the coded interviews using Markov Chains concerning typical sequences show that analyzing the results regarding misconceptions and errors of students seems to be important for constructing implications. However, those elaborations are quite complex and take a lot of time and effort. Therefore, we are going to conduct in the second (confirmatory) part of the study a within-person experiment to identify easy to read and to interpret visualizations of formative assessment data. We expect small positive effects of heatmaps (vs. table) on efficiency and accuracy of grouping students and assigning appropriate learning goals to them. At the conference, all data are going to be fully analyzed and results are going to be presented in detail. Based on these insights, implications will be discussed.

Evaluating the automatic scoring of text comprehension diagrams as feedback for monitoring accuracy

Keywords: Computer-assisted Learning, Learning Technologies, Metacognition, Reading Comprehension

Presenting Author: Héctor J. Pijeira-Díaz, Maastricht University, Netherlands; **Co-Author:** Sophia Braumann, University Utrecht, Netherlands; **Co-Author:** Janneke van de Pol, Utrecht University, Netherlands; **Co-Author:** Tamara Van Gog, Utrecht University, Netherlands; **Co-Author:** Anique de Bruin, Maastricht University, Netherlands

The accuracy of students' monitoring about their reading comprehension has been shown to be quite low on average. Interventions using generative tasks such as completing diagrams about causal relations in expository texts have been successful in enhancing students' monitoring accuracy, although there is still a margin for improvement. Automated feedback can further support an increase in monitoring accuracy, while also alleviating teachers' workload and having potential for integration into educational technology solutions such as intelligent tutoring systems. In addition, automated feedback could be provided individually and simultaneously to a high number of students. The automatic scoring of students' answers to the generative tasks (in this case, students' completed diagrams) could be exploited for automated feedback. Leveraging an existing dataset of more than 6000 diagram boxes (completed in Dutch by 573 secondary education students), we evaluated opportunities for the automatic scoring of those diagrams. The aim of the current study was to examine whether and how accurate advances in computational linguistics can be used for such automatic scoring. Four computational linguistic models for Dutch were identified in the literature. In combination with four standard classification algorithms used in machine learning, the most accurate solution reached 81% accuracy (i.e., four out of five answers were scored as a human did). Depending on the accuracy required for different applications, these results could be used for fully- or semi-automated scorings of students' answers to generative activities used in monitoring accuracy interventions.

Session R 2

26 August 2021 12:00 - 13:00

Session Room 12

Single Paper

Developmental Aspects of Instruction, Teaching and Teacher Education

Educational Psychology in Primary Education

Keywords: Achievement, Assessment Methods and Tools, Educational Psychology, In-service Teacher Education, Language (L1/Standard Language), Primary Education, Quantitative Methods, Teacher Professional Development

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 11 - Teaching and Teacher Education

Chairperson: Cristian Simoni, University of Padua, Italy

The profiles of teacher's professional agency development in the classroom

Keywords: Educational Psychology, In-service Teacher Education, Primary Education, Teacher Professional Development

Presenting Author: Roosa Yli-Pietilä, Tampere University, Finland; **Co-Author:** Kirsi Pyhältö, University of Helsinki, Finland; **Co-Author:** Janne Pietarinen, University of Eastern Finland, Finland

Teachers who experience strong professional agency (TPA) in the classroom make efforts to constantly learn and develop their teaching practices by reflecting and together with pupils. Finnish teachers have shown to experience strong sense of TPA in the classroom that remains stable over time and is related to teacher's sense of well-being. Still, more research is needed on the individual development of TPA, and its regulators. The aim of the present study is to find out if there are different profiles of TPA development, and if the profiles differ in burnout symptoms and abilities to use proactive strategies in regulating well-being perceived by the teachers. The survey-data has been collected at years 2016, 2017 and 2018 in Finnish schools (n=73). Altogether 1920 primary school teachers participated the survey. The data has been analysed using Structural Equation Modelling and longitudinal latent profile analysis. Four profiles were found: high and stable professional agency, moderately high professional agency, increasing professional agency, and decreasing professional agency. The burnout symptoms and proactive strategies perceived by the teachers differentiated the profiles well. Teachers perceived less burnout symptoms and more abilities to use proactive strategies when they belonged to the high and stable professional agency profile. The results indicated also that there are small groups of teachers who experience changes in their sense of TPA over time, which can be related to their sense of work-related well-being.

Reference group effects on teachers' judgements of student intelligence

Keywords: Achievement, Assessment Methods and Tools, Educational Psychology, Primary Education

Presenting Author:Julius J. Weise, Saarland University, Germany; **Co-Author:**Jörn R. Sparfeldt, Saarland University, Germany; **Co-Author:**Detlef H. Rost, Southwest University Chongqing, China

Teachers should be able to accurately assess students' achievements and accurately estimate important determinants of students' achievements (e.g., intelligence) in order to adopt their teaching behavior. In addition to medium sized correlations between teachers' judgements (TJs) of student intelligence and assessed student intelligence (Machts et al., 2016), a negative relationship between TJs of student intelligence and the average intelligence of the school class was reported (Baudson et al., 2016). A similar reference group effect was observed for teachers' nominations of gifted students (Rothenbusch et al., 2016). The aim of our investigation was to analyze reference group effects on TJs of student intelligence as well as on teachers' nominations of gifted students in one single large sample. Furthermore, important methodological improvements were realized (e.g., teachers were informed about the intelligence assessment before estimating student intelligence). The sample comprised $N = 6095$ German third graders ($k = 342$ school classes; 48.1% girls; age $M = 8.83$ years, $SD = 0.58$) and was based on data collected within the scope of the *Marburg Giftedness-Project* (Rost, 1993, 2009). The findings confirm a reference group effect on both TJs of student intelligence as well as on teachers' nominations of gifted students. As expected, student intelligence positively predicted TJs/teachers' nominations, while class-average intelligence negatively predicted TJs/ teachers' nominations. In analyses with further student and teacher characteristics, only students' gender played a significant role for TJs and nominations. Pedagogical-psychological implications of TJs of students' cognitive ability and teachers' nominations of gifted students are discussed.

Understanding oral language at school entry: dimensionality of speaking and listening skills

Keywords: Educational Psychology, Language (L1/Standard Language), Primary Education, Quantitative Methods

Presenting Author:Jessica Massonnié, University College London - Institute of Education, United Kingdom; **Co-Author:**Anna Llaurado, University College London, Institute of Education, United Kingdom; **Co-Author:**Emma Sumner, University College London, Institute of Education, United Kingdom; **Co-Author:**Julie Dockrell, Institute of Education, United Kingdom

There has been a resurgence in concern about the levels of pupils' oral language skills at school entry. To support and develop these skills effectively an understanding of the key components of oral language at this point in development is required. To address this issue, the oral language skills of monolingual English-speaking children in Reception ($M_{Age} = 57.9$ months; $n = 126$) and Year 1 ($M_{Age} = 69.07$ months; $n = 124$) were examined. Children were recruited from schools that were representative of primary schools in England. Children completed a comprehensive battery of assessments designed to tap phonology, structural language (vocabulary and grammar) and discourse skills, both in the receptive (comprehension) and expressive (production) modalities. Using confirmatory factor analyses, we examined the associations between oral language skills by component and modality for each age group. Oral language was best represented by four dimensions in the younger cohort attending Reception classes (receptive structural language, receptive discourse, expressive structural language, and expressive discourse). In contrast, in the older Year 1 pupils, three dimensions were defined, irrespective of modality: phonology, structural language and discourse skills. Structural language skills formed unique clusters for both age groups. In addition, the results highlighted the foundational role of discourse skills in oral language at the start of school. Together our data speak to the importance of capturing these dimensions when assessing and monitoring oral language skills upon school entry, particularly expressive discourse skills.

Session R 3

26 August 2021 12:00 - 13:00

Session Room 7

Single Paper

Instructional Design, Learning and Instructional Technology

Experimental Studies in Text, Graphics and Reading Comprehension

Keywords: Comprehension of Text and Graphics, Educational Psychology, Experimental Studies, Learning Approaches, Multimedia Learning, Neuroscience, Reading Comprehension

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 06 - Instructional Design

Chairperson: Robbert Smit, University of Teacher Education St.Gallen, Switzerland

How to learn with unorganized concept maps – Is organization highlighting the savior in need?

Keywords: Comprehension of Text and Graphics, Educational Psychology, Experimental Studies, Multimedia Learning

Presenting Author:Felix Kriegstein, Chemnitz University of Technology, Germany; **Co-Author:**Sascha Schneider, Chemnitz University of Technology, Germany; **Co-Author:**Maik Beege, Chemnitz University of Technology, Germany; **Co-Author:**Günter Daniel Rey, Chemnitz University of Technology, Germany

Providing concept maps in educational contexts is regarded as conducive to learning. Nevertheless, they are often offered unstructured, which harms learning success. Creating clearly structured concept maps is often difficult or not possible at all. Additional instructional support in terms of organization highlighting might be helpful for the learner to deal with information in rather unstructured and more complex concept maps. In two experiments ($N_1 = 104$; $N_2 = 155$), the effect of organization highlighting in concept maps on learning was investigated in dependence of the signaling and the spatial contiguity principle (Experiment 1) or the signaling and the segmenting principle (Experiment 2). Results show that providing concept maps with high spatial proximity or the segmenting of sub-concepts enhanced learning outcomes. Additionally, signaling was beneficial for learning in both experiments but more efficient when concept maps were non-segmented or with low spatial proximity of sub-concepts. The results will be discussed regarding the practical relevance of implemented organization highlighting tools as an orientation guide in concept maps.

Elementary School Children's Mental Representations of Narrative and Expository Texts

Keywords: Educational Psychology, Experimental Studies, Learning Approaches, Reading Comprehension

Presenting Author:Wienke Wannagat, University of Würzburg, Germany; **Co-Author:**Valentina Steinicke, University of Würzburg, Germany; **Co-Author:**Catharina Tibken, University of Würzburg, Germany; **Co-Author:**Gerhild Nieding, University of Würzburg, Germany

Using a sentence recognition task, we investigated whether elementary school children's memory of the text surface, the textbase, and the situation model differs depending on whether the text content is presented as a narrative or an expository text. Previous research with children indicates that narrative texts seem to be beneficial regarding various indicators of processing on the levels of the textbase and the situation model. However, our results did not indicate a difference between narrative and expository texts for any of the levels of representation. Furthermore, we did not find indications that prior topic knowledge has an effect on the memory of any level of representation.

A fNIRS study of static versus animated presentations processing in deaf and hearing learners

Keywords: Comprehension of Text and Graphics, Educational Psychology, Experimental Studies, Neuroscience

Presenting Author:Jean-Michel Boucheix, University of Dijon, LEAD-CNRS, France; **Co-Author:**Sebastien Laurent, IFSTTAR, France; **Co-Author:**Laurence Paire-Ficout, Université Gustave Eiffel, France; **Co-Author:**Stephane Argon, University of Dijon, LEAD-CNRS, France; **Co-Author:**Antonio R. Hidalgo-Muñoz, University of Toulouse, CLLE, France

No research has explored the brain activities underlying the processing of animated vs. static presentation in multimedia learning. This is the goal of the present experiment, in the context of learning of high way code rules in deaf candidates from multimedia presentation of road scenes. Previous study showed that, compared to their static counterparts, animation compensates for temporal processing difficulties in deaf people. The present study analyzed the brain activity underlying the decision of undertaking a driving action by using functional near infrared spectroscopy (fNIRS) technique, which has allowed covering three cortical regions: frontal, central and occipital. Thirty-seven participants were recruited (19 deaf). The task consisted in processing road scenes for determining

whether the driver had enough time to execute a driving task safely, such as overtaking. Road scenes were presented in animated format or by using a sequence of static images. Their processing required a spatiotemporal inference and a clocking mechanism about the relation between speed and distance of cars involved in the scene. The results suggest that cognitive effort – load- was higher in deaf people to process these scenes according to the higher frontal region activity. In line with other studies, the clocking mechanism involved can be measured in the central region. During decision task, cortical activity was higher in static presentation than in animation, and in deaf people, but this higher cognitive cost did not lead to higher task performance. Results encourages further studies on the neural basis of animation processing and its links with auditory capacities.

Session R 4

26 August 2021 12:00 - 13:00

Session Room 9

Single Paper

Assessment and Evaluation, Instructional Design

Assessment Methods and Tools

Keywords: Assessment Methods and Tools, Biology, Cognitive Skills, E-Learning/Online Learning, Higher Education, Instructional Design, Metacognition, Problem Solving, Vocational Education

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Susanne Seifert, University of Graz, Austria

Assessing Critical Thinking and Metacognition in Higher Education

Keywords: Assessment Methods and Tools, Cognitive Skills, Higher Education, Metacognition

Presenting Author: Felipe López, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Miguel Nussbaum, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Vito Mussuto, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Mayra Contreras, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Ricardo Paredes, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Damian Gelerstein, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Ximena López, University of Huddersfield, United Kingdom; **Co-Author:** Matías Recabarren, Universidad de los Andes Chile, Chile; **Co-Author:** Pablo Chiuminatto, Pontificia Universidad Católica de Chile, Chile

Critical thinking and metacognition are essential skills required in higher education and life. While there is a need to measure critical thinking and metacognition, no tool currently measures the two simultaneously. Our research question therefore asks: "How can we develop a tool that measures critical thinking and metacognition within the context of higher education?". A Design Based Research approach was followed to develop a test based on reading comprehension and language skills that was taken by 2,450 higher education students in Chile. The test comprises 34 questions based on situations described in micro-stories, commercials, opinion pieces, news articles and infographics. Multiple choice questions assess lower-order skills (i.e. interpretation, analysis, inference and evaluation) while constructed response questions measure higher-order skills (i.e. argumentation and metacognition). The resulting test reveals a unidimensional internal structure. In this sense, metacognition can be considered an additional component of critical thinking. Correlations between the test and the Chilean university entrance exam are weak to moderate, consistent with previous critical thinking assessment tools. Our study therefore shows it is possible to have a valid test for higher education that incorporates metacognition as a component of critical thinking and measures both skills simultaneously. The test and data are included.

Identification of Tool User Clusters Based in a Computer-Based Office Simulation

Keywords: Assessment Methods and Tools, Cognitive Skills, Problem Solving, Vocational Education

Presenting Author: Sabrina Ludwig, University of Mannheim, Germany

Abstract Problem-solving competence has evolved into a key skill for professionals in the 21st century. Computer-based business simulations enable the analysis and promotion of self-regulated problem-solving processes beyond end results such as test scores. An important aspect of successful problem-solving in computer-based settings is to follow a systematic strategy of using built-in cognitive tools and reasoning provided information efficiently. The present investigation explores students' tool use and information retrieval in a computerized problem-solving office simulation. It analyzes around 30,000 recorded behavioral log data of 432 German students in vocational education and training to identify distinct user groups as well as to assess cognitive problem-solving competences and draw a link between students' problem-solving behavior and competence. An explorative clustering analysis based on the student behavior revealed four clusters. Significant results indicated that two different methods can lead to successful problem-solving. The first successful cluster is characterized by the application of domain-general tools, also known as "weak methods" such as intensive note-taking. Second, domain-specific and solution-relevant tools are more likely to be used by the other successful cluster, such as the spreadsheet program, which proved successful due to its efficient functions (as opposed to the less successful calculator). In addition, students with higher problem-solving competence are more likely to access tools and documents, which is in line with other studies. Furthermore, successful problem-solvers differ from low-performers in terms of their tool use over time.

Without errors but not a good answer: assessing to guide progressions towards biology paradigm

Keywords: Assessment Methods and Tools, Biology, E-Learning/Online Learning, Instructional Design

Presenting Author: François Lombard, University of Geneva, Switzerland; **Co-Author:** Marie Sudries, University of Geneva, Switzerland; **Co-Author:** Séverine Perron, University of Geneva, Switzerland; **Co-Author:** Camille Larpin, University of Geneva, Switzerland; **Co-Author:** Laura Weiss, University of Geneva, Switzerland; **Co-Author:** Daniel K. Schneider, University of Geneva, Switzerland

Good answers are defined by a discipline-specific paradigm. Understanding life in terms of its underlying molecular (M) mechanisms is the core of the current biology paradigm and valid explanations are objective causalities (OC) - defining important characteristics of good responses. However, the explanations that students produce are often finalist, essentialist or anthropocentric. Education traditionally focuses on eliminating errors, which can lead to losing sight of progressions and formative guidance. Instruments to assess M-OC characteristics of student responses are needed to inform teacher guidance and to produce evidence for research on learning progressions. We present here an instrument (MOCS) to analyze student responses, producing a score for molecularity (M) and objective causality (OC).

As an illustration of the heuristic power of MOCS we applied it to a body of student productions in a collaborative writing space. M and OC scores were coded during progressions. Consolidated score means were established by cohort and by item of the reference knowledge structure map (CMap). Progression profiles for each item were also established.

While the differences between cohorts were moderate, different knowledge items produced great differences in mean scores and profiles. The heuristic power of MOCS in this example was confirmed as it empirically identified areas of the student understanding where score progressions were slow, or even decreased. Interestingly MOCS revealed very inconsistent progressions profiles across cohorts for some items. Uses of this evidence in guiding progressions and research will be discussed.

Session R 5

26 August 2021 12:00 - 13:00

Session Room 13

Single Paper

Motivational, Social and Affective Processes

Mathematics and Motivation

Keywords: Attitudes and Beliefs, Language (L1/Standard Language), Mathematics, Motivation, Quasi-experimental Research, Self-efficacy, Student Learning

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Evelyn Steinberg, Austria

Gendered self-beliefs and interests: Influencing career pathways for mid-adolescent New Zealanders?

Keywords: Language (L1/Standard Language), Mathematics, Motivation, Self-efficacy

Presenting Author: Penelope Watson, University of Auckland, New Zealand; **Co-Author:** Gavin Brown, University of Auckland, New Zealand; **Co-Author:** Bing Mei, The University of Auckland, New Zealand; **Co-Author:** Bernhard Ertl, Bundeswehr University Munich, Germany

Self-beliefs are key to academic performance and career directions, and influence career-related interests. Further, important choices for future careers must be made in mid-adolescence and the influence of gender stereotypes on self-beliefs persist despite disconfirming evidence. In New Zealand (described as a gender-essentialist society), the underrepresentation of females in STEM and underachievement and lesser interest in English for male students occurs, as in many other countries. Thus, an exploration of relationships between mathematics and English self-beliefs and performance, career-related interests, gender-role orientations, and career aspirations that might inform gendered vocational pathways, seemed warranted. The current study was conducted with mid-adolescent participants ($N = 138$; 55.1% female; $M_{age} = 14$ years) from four New Zealand secondary schools of high-mid school-level socioeconomic status, comprising a range of ethnicities (New Zealand European, Pacific Island, Māori, Asian, and other). Data were collected via several scales previously used in the German National Educational Panel Survey study, combined to comprise the Mathematics and English Self-Beliefs, Career Aspirations, and Gender-Role Attitudes in Mid-Adolescence Questionnaire. Overall, associations between self-efficacy, interest, and self-concept within mathematics and within English, and key relationships between mathematics self-concept and academic self-concept, and English and mathematics interests and specific career aspirations support the importance understanding and fostering self-beliefs for student futures. Further, although a gender-egalitarian attitude was indicated, self-beliefs and career interest still appeared to be strongly differentiated by gender. Future research could continue to probe how key influencers (e.g., teachers) could alleviate barriers to changing this status quo.

Stability and change of motivation profiles in mathematics instruction in lower secondary education

Keywords: Mathematics, Motivation, Quasi-experimental Research, Student Learning

Presenting Author: Tanja Held, University of Bern, Switzerland; **Co-Author:** Tina Hascher, University of Bern, Institute of Educational Science, Switzerland

Motivation is an important factor for successful learning processes and outcomes. Given the heterogeneity of individuals, it is of particular importance to understand differences between learners by applying a person-centered approach. The first research objective of our study was to examine students' motivation profiles based on the self-determination theory (SDT) in mathematics in lower secondary education. The second objective was to investigate how these motivation profiles change during Grade 7 and 8. The third aim was to analyze whether a particular intervention setting (students participated in workshops with the aim of promoting positive emotions and learning motivation) had an impact on the patterns of change in the specific motivation profiles compared to the control setting. Conducting Latent Profile Analysis (LPA), motivation profiles of 348 lower secondary students were recorded based on their intrinsic, identified, introjected, and extrinsic regulation. Subsequently, the transition probabilities between the profiles are estimated using the Latent Transition Analysis (LTA). Results revealed three motivation profiles: a *low-motivation profile*, a *high-motivation profile*, and a *self-determined motivation profile* with high level of stability across Grades 7 and 8. Furthermore, LTA revealed different effects of the intervention on different motivation profiles. The intervention seemed to be better tailored to students in the low-motivation profile than to students in other profiles.

Student interest in mathematics and German: Gender differences and the role of teacher expectations

Keywords: Attitudes and Beliefs, Language (L1/Standard Language), Mathematics, Motivation

Presenting Author: Elisa Oppermann, University of Bamberg, Germany; **Co-Author:** Rebecca Lazarides, University of Potsdam, Germany

The existence of gender differences in student interest in math and language has been widely shown in empirical research. Whereas many studies focus on gender differences in adolescence, until now, gender differences in students' domain-specific motivation are not well researched in earlier ages such as elementary school. Moreover, the role of teachers' (potentially stereotypical) beliefs about students' talents in math and language for the development of gender differences in student interest is not well understood. The present study tackled these research gaps based on a sample of 2,316 students (48% girls) and their 154 teachers in 3rd and 4th Grade in 82 elementary schools in Germany. Growth curve modelling showed that math interest declined throughout elementary school and that significant gender-related level differences already occurred in the middle of Grade 3 for both math and language interest with boys reporting higher interests in math and girls reported higher interest in German language. These gender differences remained stable until the end of Grade 4, but did not intensify (no significant gender differences in the slope). Teachers' beliefs about students' talents were stereotypically biased: Teachers overestimated girls in language and boys in math – controlling for students' achievement in these subjects. These biased teacher beliefs were positively associated with students' initial level of interest in Grade 3 in math and language, indicating that teachers' biased beliefs may contribute to existing gender differences in student interest already early in elementary school.

Session R 6

26 August 2021 12:00 - 13:00

Session Room 1

Single Paper

Assessment and Evaluation

Assessment in Student Learning

Keywords: Assessment Methods and Tools, Quantitative Methods, Science Education, Self-regulation, Student Learning, Teacher Professional Development, Teaching/Instruction, Video Analysis

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Roger Säljö, University of Gothenburg, Sweden

The diagnostic test evaluation and the student misconception development in science

Keywords: Assessment Methods and Tools, Quantitative Methods, Science Education, Student Learning

Presenting Author: Soeharto Soeharto, University of Szeged, Doctoral School of Education, Indonesia; **Co-Author:** Benő Csapó, University of Szeged, Hungary

This study aims to assess the item difficulty patterns, Differential Item Functioning (DIF), validity and reliability parameter, and the student misconception development in science from the middle school and pre-service teachers. Participants were drawn using random sampling from 856 students at the middle school and pre-service teacher in Indonesia. The statistical analysis was employed to perform Rasch measurement, descriptive statistics, and ANOVA using SPSS and Winsteps software. All data set were investigated to explore item and person interaction. We found the reliability of items in the developed test represented good criteria more than 0.7 (0.81 for persons and 1.00 for items). The unidimensionality of the raw variance explained by the measure is more than 30%, confirming validity achieved. The item fit analysis results show that the mean of outfit MNSQ and ZSTD are 0.95 ($SD = 0.1$) and -0.42 ($SD = 1.87$), respectively. However, there are three misfit items based on the outfit MNSQ value. DIF analysis showed that the 1 item in chemistry subject had bias based on gender in the moderate to large category. No significant differences were found in the test and whole grade school levels and science subject ($p > .05$). This finding indicates that each cohort is not different between girls and boys, and all students have the same distribution of misconceptions across science concepts. The developed diagnostic test and practical analysis using Rasch measurement are expected to be guidelines and suggestions for other researchers in developing student misconceptions research and diagnostic test in science learning.

Assessing instructional quality based on first impressions of untrained observers

Keywords: Assessment Methods and Tools, Student Learning, Teaching/Instruction, Video Analysis

Presenting Author: Lukas Begrich, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:** Mareike Kunter, DIPF | Leibniz

Institute for Research and Information in Education, Germany; **Co-Author:**Susanne Kuger, German Youth Institute (DJI), Germany; **Co-Author:**Benjamin Caspar Fauth, University of Tübingen, Germany

We present results of two studies that test an innovative approach of assessing instructional quality: the thin slices procedure which uses first impressions of untrained observers. We apply the thin slice procedure to obtain ratings of instructional quality along the dimensions of cognitive activation, classroom management, and constructive support based on only 30 s of classroom observations randomly sampled from full classroom videos (Study 1: 97 classroom videos, 30 raters; Study 2: 20 classroom videos, 24 raters). Both studies clearly demonstrate the high reliability of thin slices ratings of instructional quality in terms of very high agreement between the observers (average ICC = .88). In study 1, multilevel confirmatory analyses suggests construct validity of thin slices ratings of instructional quality in terms of differentiation between the three dimensions. Furthermore we find overlap of thin slices ratings of classroom management and constructive support with ratings of the same dimensions given by trained raters based on the full classroom videos. Study 2 is concerned with the predictive validity of thin slices ratings with regard to student learning. Comparing ratings given by university students, middle school students and educational research experts, we find that thin slices ratings provided by each group are predictive with respect to students' short term learning progress. Furthermore, we find experts' and middle school students' ratings of classroom management and constructive support, respectively, to have incremental validity predicting student learning. The results are discussed in view of the usefulness of thin slices ratings for instructional research.

By The Teacher Side: Strategies and Practices for Student Self-assessment

Keywords: Assessment Methods and Tools, Self-regulation, Student Learning, Teacher Professional Development

Presenting Author:Serafina Pastore, University of Bari, Italy

This paper focuses on self-assessment practices of primary and secondary school teachers in Italy. Over the years, an increasing number of studies have been carried out on self-assessment. In the assessment for learning perspective, self-assessment is related to reflection, metacognition, and self-regulation of learning: all these aspects are considered as fundamental prerequisites for students' learning. Therefore teachers are encouraged to incorporate a range of different assessment practices. An extensive body of literature has been produced regarding principles and practice guidelines for student self-assessment. However, what are practices and strategies used by teachers in the classroom context? Entering this lively debate, the present paper reports on a research study aimed to analyse through a questionnaire administration, teachers' practices for student self-assessment. A descriptive analysis and a principal components factor analysis (PCA) have been performed. This study represents a useful step in understanding teachers' strategies for student self-assessment. Results may set the groundwork for further improvements in the educational assessment field.

Session R 7

26 August 2021 12:00 - 13:00

Session Room 4

Single Paper

Motivational, Social and Affective Processes

Motivation and Psychometrics

Keywords: Attitudes and Beliefs, Higher Education, Literacy, Motivation, Psychometrics, Qualitative Methods, Science Education, Student Learning

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Kaire Uiboleht, University of Tartu, Estonia

Keep on watching? Context and domain specificity of interest in networks of science video watching

Keywords: Motivation, Psychometrics, Science Education, Student Learning

Presenting Author:Maïen Sachisthal, University of Amsterdam, Netherlands; **Co-Author:**Brenda Jansen, University of Amsterdam, Netherlands; **Co-Author:**Thea Peetsma, University of Amsterdam, Netherlands; **Co-Author:**Maartje Raijmakers, Vrije Universiteit Amsterdam, Netherlands

In voluntary learning situations, in which the learner can disengage from the learning material at any instance, personal characteristics and the context (subject-domain and specific learning material) have been shown to influence learners' responses. The response model included in the current study is adapted from text-based learning studies and includes topic interest, situational interest, persistence and the learning outcome. Personal characteristics include domain-specific individual interest, curiosity, prior knowledge and gender. Our first aim was to replicate earlier findings from text-based learning in a context of science video watching. Secondly, we aimed to test whether the interplay of personal characteristics and response variables is domain-specific or even material-specific, by including two videos per content domain. To map the complex interplay of personal characteristics and response variables, we employed a psychometric network approach, which enabled us to directly test whether the structure of interrelations is domain- or material-specific. Our results show that relations between personal characteristics and response variables are similar to those in text-based learning and in a science video watching context. The response model from topic interest to learning outcome, mediated by situational interest and persistence was replicated. Moreover, structural differences in the complex interplay seem to be domain-specific and not material-specific.

Perceptions of Preparedness and Success Inform Undergraduates' Feelings of Belonging

Keywords: Attitudes and Beliefs, Higher Education, Motivation, Qualitative Methods

Presenting Author:J. Elizabeth Richey, Carnegie Mellon University, United States; **Co-Author:**Nikki Lobeckowski, Carnegie Mellon University, United States; **Co-Author:**Kevin Jarbo, Carnegie Mellon University, United States; **Co-Author:**Elise Morton, Georgia Institute of Technology, United States; **Co-Author:**Ken Koedinger, Carnegie Mellon University, United States

Students' feelings of academic belonging are important predictors of achievement and persistence, making it an important construct to examine in the context of challenging math courses in which students often fail or drop out. Current research has focused on the antecedents of belonging, and less is known about the factors that influence students' feelings of belonging, particularly in college. We conducted focus groups in which students discussed their experiences with challenges in math learning and how those experiences related to their feelings of belonging. Students' perceptions of their own preparedness, particularly relative to their classmates, emerged as a common theme associated with negative feelings of belonging. While much existing literature focuses on the impact of social interactions and inclusion on belonging, this research suggests that students' feelings of preparedness also play an important role in determining belonging in challenging college courses. This pathway to belonging suggests alternative pedagogical approaches and interventions that may successfully improve feelings of belonging and, as a result, support students' achievement and persistence.

Measuring reading attitudes of Kindergartners and 1st-Graders

Keywords: Attitudes and Beliefs, Literacy, Motivation, Psychometrics

Presenting Author:Lisa van der Sande, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Marjolein Dobber, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Jo van Schaik, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Roel van Steensel, Erasmus University Rotterdam, Netherlands

Purpose. Although reading attitudes are found to be an important factor in students' reading development, relatively little is known about the reading attitude of beginning readers. In the current study, the reliability and validity of two reading attitude measurements were examined in two cohorts of beginning readers. Additionally, reading attitudes of students before (Kindergarten) and after the start of formal reading instruction (Grade 1) were compared. Methods. 211 kindergartners and 257 Grade 1 students completed several measurements as indicators of reading attitudes (a traditional questionnaire and a more visual instrument), decoding skills, receptive vocabulary, text comprehension, and the (home) literacy environment. Results. Both reading attitude measurements had adequate reliability and scores on these measurements were weakly correlated. Significant positive correlations between reading attitude and reading achievement were found in Grade 1, but not in Kindergarten. Stronger correlations were found between reading achievement and the Picture Evaluation Task than between reading achievement and the Reading Attitude Scale. Finally, it was found that students in Grade 1 had a more positive attitude towards reading than students in Kindergarten. Conclusion. The Picture Evaluation Task appeared to be a more valid measure of reading attitude for beginning readers than the

Reading Attitude Scale. It may be more appropriate for younger students, as this visual measure does not require language skills. Besides, the results indicate that reading attitudes become more positive when students start reading education, although longitudinal studies are needed to get more insight into the development of reading attitudes.

Session R 8

26 August 2021 12:00 - 13:00

Session Room 6

Single Paper

Assessment and Evaluation

Assessment Methods and Tools

Keywords: Assessment Methods and Tools, Case Studies, Higher Education, Learning Analytics, Learning Approaches, Meta-analysis, Teaching/Instruction, Vocational Education, Workplace Learning

Interest group: SIG 01 - Assessment and Evaluation, SIG 14 - Learning and Professional Development

Chairperson: Ivy Lau, Hong Kong Baptist University, Hong Kong

Unravelling workplace educators' judgement processes when assessing students' performance

Keywords: Assessment Methods and Tools, Case Studies, Vocational Education, Workplace Learning

Presenting Author: Marlies de Vos, Open University the Netherlands, Netherlands; **Co-Author:** Liesbeth Baartman, Utrecht University of Applied Sciences, Netherlands; **Co-Author:** Cees van der Vleuten, Maastricht University, Netherlands; **Co-Author:** Elly de Bruijn, Hogeschool Utrecht / OU, Netherlands

Assessing workplace learning by workplace educators is a complex and inherently social process, as the workplace is a participatory learning environment. We therefore propose seeing assessment as a process of judgement embedded in a community of practice and to this purpose apply the philosophy of inferentialism to unravel the judgement process of workplace educators by approaching it as an interrelated system of judgements, actions and reasons. Since we aimed at studying a process, we applied a longitudinal holistic case study design. Results show that educators are engaged in a constant judgement process during which they use multiple and adaptive frames of reference when forming their judgement about students. Further, we found that during this process educators form an overarching image of students which develops throughout placement, and that their judgements go hand in hand with their actions relating to fostering independent practice.

Pedagogical Assessment: Relationships between Space, Active Learning, and High-order Thinking Skills

Keywords: Assessment Methods and Tools, Case Studies, Learning Approaches, Teaching/Instruction

Presenting Author: Irit Sasson, Tel-Hai College, Israel; **Co-Author:** Shirley Miedjinsky, Oranim Academic College, Shamir Institute, University of Haifa, Israel; **Co-Author:** Itamar Yehuda, Tel Hai Academic College, Israel

Recent years have been marked by the development of new pedagogical models and the designing of new learning spaces. The multiple-case study presented here includes four schools that are in a process of implementing a pedagogical change which follows the constructivist approach. In all four schools, initiatives are gradually being developed and include the redesigning of learning spaces. The space serves as an agent to reconceptualize the learning environment to foster active, social, and experiential learning. The aim was to characterize learning environments by space, pedagogical practices and curricular potential in order to explore the relationships between space, active learning, and the development of high-order thinking skills (HOT). Characterization of teaching and learning processes was based on 658 class observations and analysis of 428 learning tasks. The findings indicate a higher expression of active learning in the innovative learning spaces compared with the traditional spaces in all cases. Nevertheless, results show difficulties in developing HOT skills, with relatively low encouragement for creative thinking, problem solving, decision making, and critical thinking. Learning tasks emphasize low cognitive complexity. The study demonstrates a pedagogical characterization of initiatives using several cases and hence its importance.

Using machine learning to support study selection for a meta-analysis on simulation-based learning

Keywords: Assessment Methods and Tools, Higher Education, Learning Analytics, Meta-analysis

Presenting Author: Olga Chernikova, Ludwig Maximilian University, Germany; **Co-Author:** Ivan Melev, Ludwig Maximilian University, Germany; **Co-Author:** Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

The paper describes development and application of machine learning algorithms aiming at semi-automatic selection of abstracts for a meta-analysis on effects of simulation-based learning in higher education. The algorithms were trained, validated and tested on a set of 3209 studies on simulation-based learning found in medical and educational databases by April 2018 and afterwards applied to classify abstracts from a completely new sample of 2373 studies (published between 2018 and 2020). The aim of training algorithms was to predict eligibility based on the words and their combinations used in abstract of the study. The two algorithms agreed on classifying 87% of abstracts from the new sample. The disagreement was resolved by experienced human raters. The process was similar to double-coding in manual abstract screening to guarantee objective and transparent selection process. Application of the algorithms reduced the amount of studies to be manually screened from 2373 to 711 (400 classified as eligible by both algorithms and 311 classified as eligible by at least one algorithm). 458 studies from automatically selected abstracts were included in full-text screening, which indicated high precision of the algorithms. We conclude that machine learning algorithms can be trained and used to significantly reduce the workload without threat to objectivity and quality of the meta-analysis.

Session R 9

26 August 2021 12:00 - 13:00

Session Room 16

Single Paper

Higher Education, Teaching and Teacher Education

Teacher Professional Development and Workplace Learning

Keywords: Higher Education, Interdisciplinary, Synergies between Learning; Teaching and Research, Teacher Professional Development, Technology, Vocational Education, Workplace Learning

Interest group: SIG 14 - Learning and Professional Development

Chairperson: Natalie Peters, Germany

Professional development preferences for blended learning in higher education teaching staff

Keywords: Higher Education, Teacher Professional Development, Technology, Workplace Learning

Presenting Author: Anja Garone, Vrije Universiteit Brussel, Belgium; **Co-Author:** Sarah Howard, University of Wollongong, Australia; **Co-Author:** Jack Yang, University of Wollongong, Australia; **Co-Author:** Jo Tondeur, Vrije Universiteit Brussel, Belgium; **Co-Author:** Bram Pynoo, VIVES hogeschool, Belgium; **Co-Author:** Katrien Struyven, Hasselt University / Vrije Universiteit Brussel, Belgium

This study presents an initial analysis of a survey measuring professional development needs and preferences in the context of professionalization for blended learning in two higher education institutes. The items are based on previously defined models of professional development, inspired by Kennedy's (2014) models of professional development. A data mining approach (association rules analysis) was employed to explore the patterns among the items. Results indicate that professional development is a complex experience for this group of professors and other teaching staff. Furthermore, our results show a preference for a fluid, combined approach rather than separate or single model approaches to professional development.

Innovation and Transformational learning

Keywords: Higher Education, Teacher Professional Development, Vocational Education, Workplace Learning

Presenting Author: Ilse Terpstra-Kamstra, Saxion University of Applied Sciences, Netherlands; **Co-Author:** Els Boshuizen, Open University of the Netherlands, Netherlands

This study investigates the role of domain expertise and teaching expertise of teachers in Universities of Applied Sciences, their self-directed learning capabilities (SDLC) and employability in their innovative behaviour and transformational learning. Also, the role of organizational features supporting innovation was investigated. It was found that innovative teachers profited from their expertise in both domains, but especially in combination with SDLC, while employability features also played a role. Findings for transformative learning showed a similar but less pronounced picture. Effects of organizational features could not be found. It was concluded that supporting SDLC development can have a positive outcome on teachers' (and students') effectiveness in times of change.

The three paradoxes of professional learning

Keywords: Interdisciplinary, Synergies between Learning; Teaching and Research, Teacher Professional Development, Workplace Learning

Presenting Author: Riikka Hofmann, University of Cambridge, United Kingdom

A persistent challenge of professional development is that even when practitioners successfully engage, actual sustained change in subsequent professional practice remains elusive. To develop further theoretical insights into this puzzle, this study focuses on analysing and conceptualising the nature of the barriers to sustained professional change and the mechanisms through which they work to hinder the development of new forms of practice. This study re-analyses findings from five studies on professional learning in educational and healthcare settings through a systematic comparative approach, framed by sociocultural and activity-theoretical models of change. It finds that three paradoxes of professional learning regularly stop professionals from enacting change in their practice even after successful professional development, and terms these the Paradox of Agency; the Paradox of Other People and the Paradox of Risk. The nature of these paradoxes and their implications to effective professional development and professional learning theory are discussed.

Session R 10

26 August 2021 12:00 - 13:00

Session Room 11

Single Paper

Motivational, Social and Affective Processes

Educational Psychology, Motivation and Emotion

Keywords: Attitudes and Beliefs, Educational Psychology, Emotion and Affect, Mathematics, Motivation, Motivation and Emotion

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Elisabeth Wegner, University of Freiburg, Germany

The effects of situational interest and task effort on eighth-graders' math test performance

Keywords: Educational Psychology, Mathematics, Motivation, Motivation and Emotion

Presenting Author: Anna Tapola, University of Helsinki, Finland; **Co-Author:** Maximilian Knogler, Technical University of Munich (TUM), Germany; **Co-Author:** Markku Niemivirta, University of Eastern Finland, Finland

Situational interest and effort expenditure both support students' performance in academic tasks. However, compared to effort, the results concerning situational interest are more inconsistent, sometimes showing only weak, or non-significant direct effects. To account for the mixed results, it has been suggested that the effect of situational interest on performance might be mediated by effort. The aim of this study was to explore this possibility by examining both the direct and mediated effects of self-reported situational interest and effort on eighth-graders' ($N = 288$) performance in a mathematics test, while controlling for gender, previous grade, and domain-general interest and effort in mathematics. Findings from a model applying structural equation modeling showed that while task effort predicted performance positively, the direct effect of situational interest was not significant. However, the indirect effect of situational interest, mediated by effort, was significant. Performance was also predicted by gender (in favor of boys), and previous math grade, while interest and effort in mathematics contributed to students' task effort and situational interest. Our findings suggest that interest without effort, the conscious attention focus and persistence, may not be enough to support performance. However, interest seems to be a factor that energizes students' effort expenditure, and thereby, also contributes to task performance.

Longitudinal effects of perceived classroom support on students' achievement emotions

Keywords: Educational Psychology, Emotion and Affect, Motivation, Motivation and Emotion

Presenting Author: Francisco Peixoto, ISPA - Instituto Universitário / CIE - ISPA, Portugal; **Co-Author:** Lara Forsblom, ISPA - Instituto Universitário / CIE - ISPA, Switzerland; **Co-Author:** Lourdes Mata, ISPA - Instituto Universitário / CIE - ISPA, Portugal

The current study examined cross-sectional and longitudinal relationships amongst perceived teacher and perceived peer support, cognitive appraisals, and three achievement emotions (enjoyment, anger, and boredom) in math classrooms using a full-panel design with two measurement points over a 1-year period. The participants were 548 5th and 7th grade students from nine public schools in Portugal. Relationships were analyzed with structural equation modelling (autoregressive cross-lagged panel modelling). The results showed that students' perceived peer support positively predicted their positive value appraisals. Students' perceived competence positively predicted their enjoyment and negatively predicted their anger, whereas students' positive value appraisals negatively predicted their boredom. Moreover, the findings revealed significant effects of perceived classroom support on emotions. Students' perceived teacher support negatively predicted their boredom, whereas their perceived peer support positively predicted their enjoyment and negatively predicted their boredom. The findings are discussed regarding theoretical and practical implications.

Meaning in life and resilience among teachers

Keywords: Attitudes and Beliefs, Educational Psychology, Emotion and Affect, Motivation, Motivation and Emotion

Presenting Author: Maria Platsidou, University of Macedonia, Greece; **Co-Author:** Athena Daniilidou, University of Macedonia, Greece

Meaning in life is a significant resource in the resilience process, supporting the use of adaptive behaviors and enhancing the feeling of wellbeing. As such, it could be critical for teachers who encounter many stressors threatening their life quality and work productivity. This study aimed to investigate how teachers' levels of meaning in life relate to their resilience. Data were collected from 299 teachers using the Meaning in Life Questionnaire (assessing presence of and search for meaning) and the Multidimensional Teacher Resilience Scale (assessing protective factors related to motivational and professional, social, and emotional resilience). As predicted, presence of meaning had medium-sized positive correlations with the resilience factors, whereas search for meaning had low correlations with social resilience and professional-motivational resilience and no correlation with emotional resilience. Using K-means cluster analysis, teachers were grouped into three clusters according to their scores in the two meaning dimensions. The cluster of teachers reporting both high presence of and high search for meaning showed the highest scores on the resilience factors, followed by the cluster including teachers with high presence and low search. In conclusion, our results emphasized the important role of presence of meaning in strengthening resilient responses; also, searching for meaning, when combined with a high sense of meaning, relates to better use of the resilience protective factors and resources. As to the study implications, a meaning-centered approach to building resilience in teachers is suggested and discussed.

Session R 11

26 August 2021 12:00 - 13:00

Session Room 17

Single Paper

Learning and Special Education

At-risk Students

Keywords: Achievement, Assessment Methods and Tools, At-risk Students, Educational Psychology, Experimental Studies, Learning and Developmental Difficulties, Special Education, Student Learning, Teaching/Instruction

Interest group: SIG 15 - Special Educational Needs, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Franco Rau, University of Vechta, Germany

Facilitating novel word learning in pupils at inclusive elementary schools via iconic gestures

Keywords: At-risk Students, Experimental Studies, Learning and Developmental Difficulties, Teaching/Instruction

Presenting Author: Carina Lüke, University of Würzburg, Germany; **Co-Author:** Nathalie Frey, University of Würzburg, Germany

Iconic gestures facilitate novel word learning in individual face-to-face interactions with adults. Since novel word learning is crucial for children with difficulties in language acquisition or a low socioeconomic status, we investigated the effect of iconic gesture presentation in classroom didactics in an inclusive elementary school. The sample consists of 124 pupils (84% bi- or multilingual, 56% girls) from eight classes in the school entry phase. Following a participatory research strategy, teachers chose "geometric surfaces and solids" as topic and 12 corresponding words (e.g., square, rectangle) as the target academic vocabulary. These words were tested for receptive and productive knowledge before and after four standardized lessons. The classes were randomly assigned to one of two conditions: with gestures (+g) or without gestures (-g). The teachers of the +g condition were trained to use iconic gestures while naming the target words. In our analyses (mixed ANOVAs with time x condition), we found a main effect of time for receptive and productive vocabulary size indicating that both groups achieved significant learning gains in receptive and productive acquisition of the target words through the lessons. But, there was also an interaction effect between time and condition with regard to productive vocabulary size indicating that the children from the +g condition learned more novel words. Iconic gestures can be easily implemented in inclusive elementary classroom didactics and can support the acquisition of novel words, such as academic vocabulary.

Inclusive education and assessment: Teachers' intentions to use an accommodate teaching material

Keywords: Assessment Methods and Tools, At-risk Students, Educational Psychology, Experimental Studies

Presenting Author: Mickaël Jury, Clermont Auvergne University, France; **Co-Author:** Kamilla Khamzina, Université Clermont Auvergne, France; **Co-Author:** Sylvette Menge, INSPE Clermont Auvergne, France; **Co-Author:** Caroline Desombre, INSPE Lille Haut-de-France, France

The goal of the present research is to examine the extent to which the inclusive education policy is compatible with the selection function of the educational system. More precisely, we argue that selecting students based on their individual merit is incompatible with the inclusive education paradigm. To test this hypothesis, we examined teachers' intentions to use an accommodated teaching material (in comparison with a non-accommodated one) to a student's special educational needs in a learning or an assessment phase. Results from an online experiment conducted with 600 French teachers confirm that the latter are less willing to use an accommodated material for an exam in comparison with the learning phase. Results will be discussed according to the limitations of the present study but also the need to consider the institutional functioning when studying the barriers regarding the implementation of inclusive education.

Noise-Cancelling Headphones for Students With Special Needs: A Systematic Scoping Review

Keywords: Achievement, At-risk Students, Special Education, Student Learning

Presenting Author: Paweł R. Kulawiak, University of Potsdam, Germany

Classroom noise impairs learning in students. Thus, the literature and guidelines emphasize academic benefits of wearing noise-cancelling headphones during class, especially for students with special needs. None of these recommendations refers to any studies on academic benefits of wearing noise-cancelling headphones, indicating a potential research gap and lack of evidence. Therefore, the question arose: Is there any empirical evidence supporting academic benefits of wearing noise-cancelling headphones during class for typically developing students or students with special needs? A total of 13 empirical studies were identified through the systematic literature search. A wide range of outcomes (cognition, learning, academic performance, behavior, and emotions) were reported related to the use of noise-cancelling headphones. A broad variety of study designs were used. Typically developing students were examined in a few studies. Most of the studies refer solely to specific groups of students with special needs (learning disabilities, ASD, ADHD, etc.). In view of the limited number of studies, small sample sizes, and lack of replication studies, all studies give the impression of being pilot studies on academic benefits of wearing noise-cancelling headphones during class. Given this scattered evidence, all conclusions about academic benefits of wearing noise-cancelling headphones should be treated with caution and it does not seem to be an overstatement to say that the practice of wearing noise-cancelling headphones during class is an understudied topic. The current body of evidence does not meet the standards for evidence-based practices in general and special education. Implications for educational practice and future research are discussed.

Session R 12

26 August 2021 12:00 - 13:00

Session Room 3

Single Paper

Higher Education, Learning and Instructional Technology, Teaching and Teacher Education

E-Learning and Online Learning

Keywords: E-Learning/Online Learning, Educational Technology, Higher Education, Informal Learning, Science Education, Secondary Education, Self-efficacy, Teaching/Instruction

Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Alejandra Meneses, Pontificia Universidad Católica de Chile, Chile

Science, Maddá and 'Ilm: The Language Divide in Scientific Information Available to Internet Users

Keywords: E-Learning/Online Learning, Educational Technology, Informal Learning, Science Education

Presenting Author: Aviv J. Sharon, Technion - Israel Institute of Technology, Israel; **Co-Author:** Kawther Zoubi, Technion – Israel Institute of Technology, Israel; **Co-Author:** Eyal Nitzany, Independent Scholar, Israel; **Co-Author:** Ayelet Baram-Tsabari, Technion, Israel

The internet has potential to alleviate inequality in general and specifically with respect to science literacy. Nevertheless, digital divides persist in online access and use and in subsequent social outcomes. Among these, the "language divide" partly determines how successful users are in their internet use depending on their proficiency in languages, and especially in English. To examine whether the quality of online scientific information varies between languages when conducting searches from the same country, we compared online search results regarding scientific terms in English, Hebrew and Arabic. Findings indicate that searches in English yielded overall higher quality results, compared with Hebrew and Arabic, but mostly in pedagogical aspects, rather than scientific ones. Clustering the results by language yielded better separation than clustering by scientific field, pointing to a "language divide" in access to online science content. We argue that educational and scientific communities and institutions should mitigate this language divide.

It's here, are we ready? Exploring readiness for online teaching and implications for the future

Keywords: E-Learning/Online Learning, Educational Technology, Secondary Education, Self-efficacy

Presenting Author: Sarah Howard, University of Wollongong, Australia; **Co-Author:** Jo Tondeur, Vrije Universiteit Brussel, Belgium; **Co-Author:** Ronny Scherer, University of Oslo, Norway; **Co-Author:** Fazilat Siddiq, University of South-Eastern Norway, Norway

Implementation of blended learning in schools had been sitting on the fringes of learning and teaching for years, until 2020 and the COVID-19 pandemic. At that time, schools around the world made a rapid transition to remote teaching and learning. For teachers and students, remote teaching meant 100% online learning and teaching. In part the success of this transition relates to teachers' perceptions of their own readiness to teach online and how ready their institution is to

support online teaching. This event provided an opportunity to study teachers' readiness to transition to online teaching, across international and educational contexts. Using an online questionnaire, this study explored 222 schoolteachers' perceptions of readiness through their TPCK self-efficacy, online presence and perceived institutional support from 20 countries. Using latent profile analysis four different readiness profiles were identified, each with different implications for how teachers could be supported in future technology-related change initiatives. In this paper, the profiles will be presented and implications for future teaching will be explored through scenarios.

Emergency remote teaching in higher education: Initial insights into a living systematic review

Keywords: E-Learning/Online Learning, Educational Technology, Higher Education, Teaching/Instruction

Presenting Author: Victoria I. Marín Juarros, University of Lleida, Spain; **Co-Author:** Melissa Bond, EPPI-Centre, Institute of Education, University College London, United Kingdom; **Co-Author:** Svenja Bedenlier, Innovation in Learning Institute, University of Erlangen-Nuremberg, Germany; **Co-Author:** Marion Händel, University of Erlangen-Nuremberg, Germany

Emergency remote teaching (ERT), due to the crisis that emerged as a result of the COVID-19 pandemic, has impacted on every higher education institution around the world, which has led to widespread changes in teaching and learning. Much research has been quickly undertaken around the world to address the impact of ERT on students and teachers, as well as on higher education institutions more broadly. Our aim with this living, iterative, systematic review, is to explore the scope of research that has been undertaken, providing insight into the geographical and study characteristics, as well as the topics investigated. Initial findings of a first iteration of the systematic review include 287 studies that show the presence of all six continents in terms of participants and authors, and reveal a preference for descriptive, quantitative non-experimental research with a focus on undergraduate students and on their perceptions of online learning. Using advanced evidence synthesis tools, this work will inform higher education policy and practice, both now and into the future.

Session R 13

26 August 2021 12:00 - 13:00

Session Room 2

Single Paper

Instructional Design

History

Keywords: Design-based Research, History, Instructional Design, Quasi-experimental Research, Reasoning, Secondary Education, Writing/Literacy

Interest group: SIG 11 - Teaching and Teacher Education, SIG 12 - Writing

Chairperson: Rosario Palacios, Chile

Evaluating the trustworthiness of (historical) sources. Designing and testing of an intervention

Keywords: Design-based Research, History, Instructional Design, Reasoning

Presenting Author: Maartje van der Eem, University of Amsterdam, Netherlands; **Co-Author:** Jannet van Drie, University of Amsterdam, Netherlands; **Co-Author:** Saskia Brand-Gruvel, University of Amsterdam, Netherlands; **Co-Author:** Carla Van Boxtel, University of Amsterdam, Netherlands

Learning how to evaluate the trustworthiness of historical sources is a domain-specific skill, taught in secondary history classes in many countries. It is also a domain-general skill, since most of the procedures students have to use when working with historical sources apply to other kinds of information as well, for example when searching for information on the Internet. However, research has shown that students in secondary education struggle when evaluating the trustworthiness of (non-digital) historical sources and of information found on the Internet. The first aim of the present study is to describe the design of an intervention consisting of four lesson series on trustworthiness. The lessons were designed using the Four Component Instructional Design model (4C/ID-model), with design principles such as real-life whole tasks and a gradually decreasing amount of scaffolding. The second aim of this study was to investigate how the grade 9 students ($N=109$) and the two teachers involved in the try-out evaluated these lessons. After each of the lesson series, the students filled out a learning report and seven students were interviewed. The teachers were also interviewed, and all lessons were observed. Teachers and students were, for the most part, positive about the lesson series. Teachers valued, for example, the systematic and holistic way of teaching their students the skill. Students rated the lesson series with a 7.24 out of 10. With their feedback, some adjustments were made. In a follow-up intervention study, these improved lessons will be implemented on a larger scale.

Using analogy for teaching causal reasoning in History

Keywords: History, Quasi-experimental Research, Reasoning, Secondary Education

Presenting Author: Jannet van Drie, University of Amsterdam, Netherlands; **Co-Author:** Gerhard Stoel, RICDE / University of Amsterdam, Netherlands; **Co-Author:** Carla Van Boxtel, University of Amsterdam, Netherlands

Causal reasoning is an important goal in history teaching. However, students encounter difficulties when reasoning with causes and consequences. In this study we investigated the use of analogy combined with explicit teaching as a possible effective approach for teaching causal reasoning. Especially within the science-domain, using analogies while teaching abstract concepts proved to be successful. A pre- posttest quasi-experimental study was conducted with 123 grade 8 students. The intervention consisted of two lessons on causal reasoning using a explicit teaching approach. In the experimental group a non-historical analogy was used, whereas in the control group a historical topic was used. Data included student-constructed causal maps and questionnaires on situational interest and self-efficacy. The analysis of the causal maps did not show that the experimental group, compared to the control group, included more causes or constructed more complex maps. However, analysis of the questionnaires showed that students using an analogy were significantly more interested and showed higher self-efficacy compared to the control group. The outcomes of the causal map might have been influenced by the fact that these data were conducted online due Covid-19 measurements. Despite the limitations of this study, it can be concluded that using a non-historical analogy within explicit teaching triggered students' situational interest and increased their self-efficacy, compared to explicit teaching only.

Who benefits from a historical writing intervention? Empirical evidence from Secondary Schools

Keywords: History, Quasi-experimental Research, Secondary Education, Writing/Literacy

Presenting Author: Monika Waldis, University of Applied Sciences Northwestern Switzerland, Switzerland; **Co-Author:** Martin Nitsche, Fachhochschule Nordwestschweiz, Switzerland; **Co-Author:** Kevin van Loon, PH FHNW, Switzerland; **Co-Author:** Dominic Studer, University of Applied Sciences and Arts Northwestern Switzerland PH (FHNW), Switzerland

Research results show that historical reasoning and/or narrative competence can be fostered by domain-specific writing instruction integrating historical reading and writing strategies. However, working with multiple documents is quite challenging. Based on preliminary findings we prepared a writing training on the topics "migration" or "nationalism" with media-based writing tasks for upper secondary history classes aiming to enhance students' narrative competence. A quasi-experimental study based on a sample of 12 experimental and 7 control group classes (10th and 11th grade) with pre-/post-design revealed a substantial intervention effect on students' narrative competence. In-depth analyses of the exercise texts written during the intervention show that weaker and stronger writers benefited to different degrees from the writing training. Whereas the essays of the weaker group improved in terms of use of information from sources and accounts, structure of argumentation and quality of historical arguments, the texts of the stronger writers improved slightly in terms of media critique and historicity of core concept. Furthermore, presentism, lack of argumentative distance, and personal responsiveness on the processed topics seemed to influence students' performance. We will discuss merits and limitations of the chosen intervention design and possible implications for secondary school practice.

Session R 14

26 August 2021 12:00 - 13:00

Session Room 5

Single Paper
Higher Education, Motivational, Social and Affective Processes

Attitudes and Beliefs

Keywords: Attitudes and Beliefs, E-Learning/Online Learning, Higher Education, Instructional Design, Mathematics, Self-efficacy, Student Learning, Technology

Interest group: SIG 04 - Higher Education

Chairperson: Nina Jude, Germany

How Can Homework Design Influence Teachers' Beliefs? A Case Study in a Japanese High School

Keywords: Attitudes and Beliefs, Instructional Design, Mathematics, Student Learning

Presenting Author:Eriko Ota, Saitama Gakuen University, Japan

The purpose of this study was to find out how homework design can affect teachers' beliefs from an analysis of a research practice in which an educational psychologist and a schoolteacher collaborated. Although conceptual understanding is essential for math learning, schoolteachers are generally inclined to teach math in a procedure-oriented way. This lack of principle-oriented instruction can be attributed to teachers' beliefs, but it is still unclear what affects teachers' beliefs and how researchers can be involved in addressing this issue. The present study focuses on homework design, which teachers can utilize as an instructional tool to promote students' conceptual understanding. The author worked with a high school teacher in re-designing homework from procedure-oriented to principle-oriented tasks and collected qualitative data such as researcher-teacher discussion and homework tasks in order to identify the teacher's changes. The analysis of those data showed (i) that the teacher perceived the mental effort cost of principle-based instruction lower because designing homework enabled him to focus on critical information in each corresponding lesson, and (ii) that designed homework helped the teacher to judge his students' understanding more accurately because homework worked as a formative assessment. These results suggest that homework designing can have an impact on forming teachers' beliefs.

#Uni@Home: How did media usage change during the corona semester 2020 compared to 2018?

Keywords: Attitudes and Beliefs, E-Learning/Online Learning, Higher Education, Self-efficacy

Presenting Author:Taiga Brahm, University of Tübingen, Germany; **Co-Author:**Marina Pumptow, University of Tübingen, Germany

Due to the corona pandemic, higher education switched to digital formats in the summer of 2020, in many parts of the world including Germany. Based on an online-survey from 2018 ($n = 1171$) and from the summer of 2020 (three time points, $n = 135$ students who participated in all three surveys), data on digital media use, media-related attitudes, and self-efficacy beliefs were collected at a German university. This data makes it possible to analyze both changes in media use between the years 2018 and 2020 and in the course of the digitized semester. The results therefore contribute to higher education research by providing insights into the use of digital media and the media-related prerequisites of students at higher education institutions, as well as into the potential changes resulting from the significantly increased use of digital media in teaching and studying during the COVID-19 pandemic.

Hungarian students' experiences, attitudes towards traditional and COVID-induced digital education

Keywords: Attitudes and Beliefs, E-Learning/Online Learning, Student Learning, Technology

Presenting Author:Edit Tóth, MTA-SZTE Research Group on the Development of Competencies, Hungary; **Co-Author:**Mária B. Németh, MTA-SZTE Research Group on the Development of Competencies, Hungary; **Co-Author:**Ágnes Hódi, MTA-SZTE, Hungary

The pandemic posed an unprecedented challenge to every level and actor of education, educators, students and parents. On 30 January 2020, the World Health Organization declared an international epidemic emergency due to the COVID-19 virus epidemic. On March 11, the WHO classified the new coronavirus infection as a pandemic. On March 13, 2020, digital education was announced for both public and higher education. The aims of the research were to explore Hungarian students' experiences and attitudes towards traditional and COVID-induced digital education, to map out potential differences and identify points for further improvement in both cases. We developed a 105-item-questionnaire to fulfil the aim of the research. We analyzed 593 7th and 8th graders' responses. Data yields evidence that there are significant differences in how students view their learning management, time management, psychological barriers to learning, healthy and structured daily habits for efficient learning, teacher feedback and assistance, and satisfaction with cognitive gains and academic achievement. Their perception on the schools' academic expectations and ICT familiarity for efficient learning were similar. The differences in students' experiences and attitudes between learning in the traditional classroom environment and digital education shed light to the importance of this study. Displaying certain attitudes, characteristic features and learning styles in the traditional model does not guarantee the same or similar behaviors in the online mode. Educators and parents need to address these differences locally in order to make learning more efficient.

Session R 15

26 August 2021 12:00 - 13:00

Session Room 15

Invited Symposium

Teaching and Teacher Education

SIG 11: University teacher education in times of COVID-19

Keywords: Collaborative Learning, E-Learning/Online Learning, Higher Education, Peer Interaction, Pre-service Teacher Education, Self-regulation, Teacher Professional Development

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Jennifer Paetsch, University of Bamberg, Germany

Chairperson: Barbara Drechsel, University of Bamberg, Germany

Discussant: Lennart Schalk, Switzerland

The COVID-19 pandemic has had a substantial impact on university teacher education. Building on different degrees of digitalization within their educational and teacher education systems, universities and schools in many countries moved to distance learning or closed completely. Teacher trainers have had to switch from in-class settings to various forms of distance education and develop methods to stay in touch with their students. In addition, the practical experience in teacher education programs moved to a "distance practicum" with digital learning settings in schools and new forms of communication with supervisors and mentors. At the same time distance learning in teacher training offers future teachers opportunities to learn digital skills and get experience in using educational applications. Given these challenges for educators and students, the symposium aims at providing insights into how changes during COVID-19 have affected teaching and learning in university teacher education. The first paper examines how future teachers perceive education quality related to the COVID-19 situation. The second paper investigates which factors during university teacher training under pandemic conditions influence pre-service teachers' intentions to use digital learning materials for teaching. The last contribution shows findings from a study on the importance of mentors and peers for future teachers in practicum during pandemic distance learning. The discussion will identify country differences of pandemic study conditions, integrate the findings, and reflect on challenges for future research and university teacher education. Moreover, the symposium provides a platform for discussing how learning environments and interactions have changed in university teacher education.

Preservice Teacher's Perceptions of Learning Conditions during Covid-19

Presenting Author:Inger Marie Dalehøfte, University of Agder, Norway; **Co-Author:**Elaine Munthe, Stavanger University College, United States

In March 2020, in the middle of the spring semester in Norway, the Covid-19 pandemic led to a sudden change from physical to digital university courses. This study presents findings from an evaluation of this 'emergency remote teaching' (Hogdes et al. 2020) that happened in the following months. This unique

situation has forced many higher education teachers to work in new ways and develop new skills by trying out various synchronous and asynchronous forms of digital lectures and seminars. We aimed to investigate how preservice teachers perceived their teacher education quality related to the Covid-19 situation in general, and more specifically, related to the different instructional forms of synchronous, asynchronous and physical instruction provided. A theory-based (Deci & Ryan, 1985; Prenzel, 1995) questionnaire about learning opportunities, motivation and learning was developed and distributed to preservice teachers (PT) at two universities in Norway at two measurement points (t1 in May (n=811) and t2 in November 2020 (n=471)). Both universities offered digital courses in the spring semester and a hybrid combination of digital and physical courses in the autumn semester. The findings show that students perceive their learning opportunities, in general, to be worse than before Covid-19, but indicate that the forms of asynchronous, synchronous and physical instruction play different roles for how well they experience their learning conditions as supportive for motivation and learning. These preliminary findings also highlight specific problems and indicate possible areas of development for future digital courses.

Factors influencing intention to use digital materials among pre-service teachers during pandemic

Presenting Author:Jennifer Paetsch, University of Bamberg, Germany; **Co-Author:**Barbara Drechsel, University of Bamberg, Germany

Like in many domains, COVID-19 has put online-teaching and learning in the spotlight also in teacher education. Online-learning has become the central means of conveying knowledge in our universities. This study is designed to shed some light on the role of attitudes and online-learning experience as promoters of behavioral intentions and therefore the probability to get involved and feeling safe with online-teaching as well as using the digital methods in a constructive spirit. A sample (N=365) of pre-service teachers was asked to give their view on their (extended) online-learning experience after the first *online*-semester in summer 2020 in a questionnaire study. The results indicate that the intention to use digital materials and techniques in their future work life as teacher is connected with intrinsic motivation, learning strategies, the perceived quality of teacher training and self-reported digital skills. The results preliminary point to the conclusion that the learning-experience during COVID-19 *online*-semester is of vital importance for the pre-service teachers' ability, willingness and motivation to adopt, use, and develop digital teaching- and learning-methods in their work with school children. Implications for future research and university teacher education are discussed.

Importance of Peers for Student Teachers in an Internship during Pandemic Distance Learning

Presenting Author:Annelies Kreis, Zurich University of Teacher Education, Switzerland; **Co-Author:**Marco Galle, Zurich University of Teacher Education, Switzerland

Internships are a pivotal part of teacher education. Both learning opportunities and learning content for student teachers are influenced by the social context, the interaction partners available as well as the quality of interaction and collaboration. In a development project, the collaboration of student teachers with various actors of their social networks during internships is examined in a longitudinal survey study. 394 Student teachers for primary and lower secondary education were asked about their collaboration practices during internships in their first (t₁: 2019) and second year of study (t₂: 2020). Questions related to the frequency of collaboration with various actors (mentor teachers, university-based mentors, peers) during internship phases. However, the sudden switch of schools and universities in March 2020 to distance learning to curb the Covid pandemic changed the opportunities of student teachers for practice and interaction profoundly. A comparison of the data for t₁ and t₂ allows insights into differences in the frequency of collaboration on different aspects: The reported frequency of different forms of collaboration with mentor teachers and university-based mentors as well as the social support by these are significantly lower for t₂ than for t₁. The corresponding values for the collaboration with their peer however remain largely unchanged. The results point to the importance of a student peer as an interaction partner for student teacher learning during disturbed internship conditions such as during the lockdown because of the pandemic.

Session S 1

26 August 2021 14:30 - 15:30

Session Room 13

Single Paper

Assessment and Evaluation, Motivational, Social and Affective Processes

Attitudes and Beliefs

Keywords: Achievement, At-risk Students, Attitudes and Beliefs, Developmental Processes, Emotion and Affect, Mathematics, School Effectiveness, Secondary Education

Interest group: SIG 08 - Motivation and Emotion, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Carolina Guedes, Faculty of Psychology and Educational Sciences, University of Porto, Porto, Portugal, Portugal

The role of parents, peers, and teachers in school alienation among adolescents

Keywords: Attitudes and Beliefs, Developmental Processes, Emotion and Affect, Secondary Education

Presenting Author:Julia Morinaj, University of Bern, Switzerland; **Co-Author:**Tina Hascher, University of Bern, Institute of Educational Science, Switzerland;

Co-Author:Frederick de Moll, University of Luxembourg, Luxembourg; **Co-Author:**Andreas Hadjar, University of Luxembourg, Faculty of Language and Literature, Humanities, Arts and Educational Sciences (FLSHASE), Luxembourg; **Co-Author:**Alyssa Grecu, TU Dortmund University, Germany; **Co-Author:**Jan Scharf, DIPF | Leibniz Institute for Research and Information in Education, Germany

Previous studies have shown that socialization agents such as parents, peers, and teachers, who may function as social capital resources, can play a significant role in adolescents' educational outcomes. It is not presently clear, however, how different socialization agents predict unfavourable educational outcomes such as school alienation. The aim of the present study was to examine the role of students' perceived parent and peer attitudes toward school as well as teacher autonomy support in the development of school alienation across three school-related alienation domains (alienation from learning, from teachers, from classmates) while controlling for student gender and migration background. Data was collected from 544 Swiss and 535 Luxembourgish secondary school students longitudinally over three waves (grades 7–9). Structural equation modelling showed that the role of socialization agents varied across the school alienation domains as well as Swiss and Luxembourgish education systems, with peers having the strongest impact on adolescents' alienation across all three school-related domains. In the context of the COVID-19 pandemic with school closure and remote learning, this study contributes to discussions about the influence of socialization agents on young adolescents' academic outcomes.

School dropout - analysis of key indicators of dropout risk

Keywords: At-risk Students, Attitudes and Beliefs, School Effectiveness, Secondary Education

Presenting Author:Michaela Gläser-Zikuda, University of Erlangen-Nuremberg, Germany; **Co-Author:**Katharina Fuchs, University of Erlangen-Nuremberg, Germany

Ten years ago, the European Commission started a program for reducing the quotes of early school leavers under 10 % (European Commission, 2010). Many countries did not reach this aim up to now (Eurostat, 2020). School dropout is a very complex process, and difficult for teachers to identify, to prevent, and to start intervention early. The aim of this empirical study comprising N = 1000 secondary students (classes 5 to 9) from German schools with high dropout quotes (mostly above 10 %) is to introduce and test a model involving important theoretical and empirically proved indicators for students' disconnection to school (Hascher & Hadjar, 2018; Morinaj et al., 2020). Based on a survey especially the interplay of these indicators was analyzed. The results of the study are in line with previous research (Hadjar & Lupatsch, 2010; Morinaj et al., 2020). The results show that the most important indicators for a disconnection to learning are students' lack of intrinsic motivation, as well as lack of positive attitudes towards school, and lack of enjoyment. In addition, higher level of boredom and a lack of self-efficacy are relevant. The disconnection from learning is predominantly accompanied by feelings and thoughts of meaninglessness, and powerlessness (Seeman, 1975). Furthermore, the study confirms that students can also be socially disconnected (Hascher & Hadjar, 2018). The study also highlights the importance of classroom climate (relations between students, and between teachers and students) (Eder, 2002). Finally, implications for prevention and intervention in school practice are presented.

The Impact of SES and School Context on Academic Achievement – A Propensity Score Matching Approach

Keywords: Achievement, Attitudes and Beliefs, Mathematics, School Effectiveness

Presenting Author:Jelena Radisic, University of Oslo, Norway; **Presenting Author:**Kajsa Yang Hansen, University of Gothenburg, Sweden

The proposed study is to examine the impact of school context and students' social background on school achievement distributions. The grade eight mathematics data from four countries in the Trends in International Mathematics and Science Study (TIMSS) 2011 and 2015 was used to facilitate the investigation. These four countries are Australia, Singapore, Sweden and Slovenia, with around 48 000 students involved in the analysis. The propensity score matching (PSM) approach was applied to match each student in the low-SES group with one in the high-SES group who has a very similar estimated propensity score. A hierarchical linear model was then estimated on the matched data to examine the differential effect of students' SES and the school context on achievement, and the mediation effects of student non-cognitive variables. The results indicated a distinctive contribution of both individual and school-level SES, coupled with some unique contributions from the school context variables. From the non-cognitive variables at the student level, students' self-confidence exhibits the most pervasive influence on achievement.

Session S 2

26 August 2021 14:30 - 15:30

Session Room 17

Single Paper

Learning and Social Interaction

Peer Interaction and Argumentation

Keywords: Argumentation, Collaborative Learning, Educational Psychology, Mathematics, Peer Interaction, Problem Solving, Science Education

Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Lucia Mason, University of Padova, Italy

Using Critical Questions Productively to Improve Arguments Among Middle-School Science Students

Keywords: Argumentation, Collaborative Learning, Peer Interaction, Science Education

Presenting Author:Michael Nussbaum, University of Nevada, Las Vegas, United States; **Co-Author:**Ian Dove, University of Nevada, Las Vegas, United States; **Co-Author:**Michael Van Winkle, University of Nevada Las Vegas, United States; **Co-Author:**Kris Carroll, Clark County School District, United States; **Co-Author:**LeAnn Putney, University of Nevada, Las Vegas, United States

The teaching of scientific argumentation in schools has been dominated by McNeil and Krajcik's (2007) claim-evidence-reasoning (CER) model. While completing CER diagrams have their place, the CER model oversimplifies the process of argumentation with little connection to student discourse, including argument critique. Yet such discourse is essential for conceptual understanding and mastering scientific practices. To help remedy these deficiencies, this study combines the use of CERs with *critical questions* (CQs) that assess the strength and cogency of arguments and which support critical discourse. We conducted a year-long professional development program for middle-school teachers on scientific argumentation where teachers were encouraged to design lessons involving both CERs and CQs. Qualitative analysis of data from six participating teachers, drawing primarily on lesson transcripts and exit interviews, revealed two themes. First, teachers varied in the number of CQs emphasized in their lessons; teachers with more experience in facilitating discourse were more likely to use the CQs. Second, the CQs helped to improve the depth and focus of student discourse. They also afforded more discussion of the meaning of "good evidence." The results show that CQs can be used productively by middle-school students to engage in evaluative discourse grounded in contemporary models of argumentation.

The argumentative effect of productive failure

Keywords: Argumentation, Collaborative Learning, Educational Psychology, Peer Interaction

Presenting Author:Antonia Larrain, Universidad Alberto Hurtado, Chile; **Co-Author:**Maria José Barrera, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Valeska Grau, Pontificia Universidad Católica de Chile, Chile

Productive failure (Kapur, 2008) has shown to promote disciplinary content knowledge. However, there is no clear theoretical explanation regarding why productive failure has this benefit. Considering that collaborative problem solving, typically involves the practice of argumentation, and the empirical evidence showing the effect of collaborative argumentation on delayed learning, we hypothesize that the practice of argumentation involved in productive failure could prompt learning. In order to contribute to this knowledge gap, we report a qualitative exploratory case study aimed at comprehending the role of argumentation in the effect of productive failure, in which students discussed collaboratively problems of organic evolution during six weekly sessions. One group of five sixth graders students (one male) of one public school of [City, Country] participated in the study. They had no formal instruction on evolution before the study, and were asked to discuss six different problems and agree on solutions via oral argumentation. Students were assessed individually using both pre- and delayed post-test of knowledge on evolution. All the sessions were videotaped and students' dialogue was micro-analyzed. Results show that even when students had no formal instruction in organic evolution, and they failed in finding correct solutions, they engaged in group argumentation which are likely to lead them to learning.

Dialogic Engagement in Geometry Peer Learning: A Commognitive Discursive Lens

Keywords: Collaborative Learning, Mathematics, Peer Interaction, Problem Solving

Presenting Author:Naama Ben-Dor, Technion - Israel Institute of Technology, Israel; **Co-Author:**Einat Heyd-Metzuyanim, The Technion Israel Institute of Technology, Israel

In this paper, we draw on the commognitive framework to explore how students' dialogic engagement during peer interactions contributes to object/meta-level learning. We pursue our goal by focusing on peer problem-solving in middle school geometry. Comparing students' routines when working apart with their joint routines when working together, we identified four types of routine growth. Three types were object-level growth, and one was meta-level growth. In addition, we found that dialogic engagement, which included following partner's procedures, claims and visual mediators as well as *building* on partner's discourse, contributed to the identified types of growth. We discuss these findings in terms of the usefulness of the commognitive framework for concomitantly exploring dialogic engagement and the growth in students' discourse.

Session S 3

26 August 2021 14:30 - 15:30

Session Room 5

Single Paper

Cognitive Science, Learning and Special Education

Educational Psychology and Literacy

Keywords: Cognitive Development, Conversation/Discourse Analysis, Educational Psychology, Learning and Developmental Difficulties, Literacy, Mathematics, Numeracy, Reading Comprehension

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 05 - Learning and Development in Early Childhood

Chairperson: Deborah Pino-Pasternak, University of Canberra, Australia

Longitudinal Effects of Parental Difficulties and Home Environment on Reading and Math Development

Keywords: Educational Psychology, Learning and Developmental Difficulties, Literacy, Numeracy

Presenting Author:Daria Khanolainen, University of Jyväskylä, Finland; **Co-Author:**Maria Psyridou, University of Jyväskylä, Finland; **Co-Author:**Gintautas Silinkas, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland; **Co-Author:**Pekka Niemi, University of Turku, Finland; **Co-Author:**Anna-Maija Poikkeus, University of Jyväskylä, Finland; **Co-Author:**Minna Torppa, University of Jyväskylä, Finland

This study focuses on parental reading and mathematical difficulties, the home literacy environment, and the home numeracy environment as well as their predictive role in Finnish children's reading and mathematical development through Grades 1–9. We examined if parental reading and mathematical difficulties directly predict children's academic performance and/or if they are mediated by the home learning environment. Mothers (n = 1590) and fathers (n = 1507) reported on their reading and mathematical difficulties as well as on the home environment (shared reading, teaching literacy, and numeracy) when their children were in kindergarten. Tests for reading fluency, reading comprehension, and arithmetic fluency were administered to children in Grades 1, 2, 3, 4, 7, and 9. Parental reading difficulties predicted children's reading fluency, whereas parental mathematical difficulties predicted their reading comprehension and arithmetic fluency. Familial risk was associated with neither formal nor informal home environment factors, whereas maternal education had a significant relationship with both, with higher levels of education among mothers predicting less time spent on teaching activities and more time spent on shared reading. In addition, shared reading was significantly associated with the development of reading comprehension up to Grades 3 and 4, whereas other components of the home learning environment were not associated with any assessed skills. Our study highlights that taken together, familial risk, parental education, and the home learning environment form a complex pattern of associations with children's mathematical and reading skills.

Executive Functioning as a Predictor of Children's Mathematics, Reading and Writing

Keywords: Cognitive Development, Educational Psychology, Literacy, Mathematics

Presenting Author:Deborah Pino-Pasternak, University of Canberra, Australia; **Co-Author:**Debora Valcan, Murdoch University, Australia; **Co-Author:**Helen Davis, Murdoch University, Australia; **Co-Author:**Anabela Malpique, Murdoch University, Australia

Executive functioning (EF) in early childhood predicts both concurrent and future academic achievement. Nevertheless, few studies have investigated the potential pathways through which this might occur. The present study compared two models through which EF might plausibly predict academic outcomes one year later. Structural equation modelling analyses were conducted on a longitudinal dataset from 176 children at the end of Kindergarten (age $M= 5$ years, 8 months; $SD = 4.02$ months) and one year later (age $M= 6$ years, 5 months; $SD = 3.65$ months). Kindergarten EF predicted Year 1 mathematics and handwriting automaticity only via Kindergarten mathematics and handwriting automaticity, respectively. In contrast, Kindergarten EF predicted Year 1 reading and writing quality directly, as well as indirectly via Kindergarten reading and handwriting automaticity, respectively. These results suggest that EF predicts later achievement via early achievement, and also predicts longitudinal growth potential independently of early academic achievement. **Keywords:** executive functioning, working memory, mathematics, reading, writing, early childhood

Breadth and Depth of Strategic Processing during Text Comprehension

Keywords: Conversation/Discourse Analysis, Educational Psychology, Literacy, Reading Comprehension

Presenting Author:Natalia Latini, University of Oslo, Norway; **Presenting Author:**Ymkje Haverkamp, University of Oslo, Norway; **Co-Author:**Ivar Bråten, University of Oslo, Norway

In this study, 58 Norwegian undergraduates read 10 paragraphs on a relatively unfamiliar topic. Verbal protocol analysis was used to assess strategic text processing at different levels of depth, and post-reading written reports on the topic were used to assess text comprehension. Findings indicated that irrelevant processing was negatively and a combination of surface- and deeper-level strategies was positively related to comprehension performance, but that only irrelevant processing was a unique (negative) predictor of performance after individual differences in reading comprehension skills and prior topic knowledge had been controlled for. Finally, a combination of surface- and deeper-level strategies in the absence of irrelevant processing was found to mediate the effect of prior topic knowledge on comprehension performance. Taken together, these findings highlight the potential value of combining strategies at different levels of depth into a broad strategic approach for readers who lack competence or expertise in an area.

Session S 4

26 August 2021 14:30 - 15:30

Session Room 9

Single Paper

Assessment and Evaluation, Higher Education

Competencies in Teaching and Instruction

Keywords: Competencies, Higher Education, Lifelong Learning, Quantitative Methods, Reading Comprehension, School Effectiveness, Teaching/Instruction

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education

Chairperson: Anke Schmitz, Leuphana Universitaet Lueneburg, Germany

Conceptualizing core coaching competencies for facilitating students' transition to the workplace

Keywords: Competencies, Higher Education, Lifelong Learning, Teaching/Instruction

Presenting Author:Niels van der Baan, Maastricht University School of Business and Economics, Netherlands; **Co-Author:**Inken Gast, Maastricht University, Netherlands; **Co-Author:**Simon Beusaert, Maastricht University, Netherlands; **Co-Author:**Wim Gijselaers, Maastricht University, Netherlands

Graduates often encounter difficulties with the transition from higher education to the workplace. To support students in their transition to the labour market, various pedagogical interventions such as coaching have been implemented, often taking a competence-based approach aimed at developing students' competencies. In competence-based education, teachers are expected to be highly skilled coaches. The present study aims to map the core competencies of a transition coach. Data were collected from two focus groups, consisting of coaches in higher education and in the workplace. Results show that a coach needs to support students in their needs for relatedness, competence, and autonomy. Moreover, the results emphasize the importance of the coach's professional attitude and knowledge about the transition process and about the labour market. The article concludes with a practical framework for how to coach students in higher education. By providing the student with the necessary support conditions and stimulating students' reflection, the coach will be able to facilitate students' transition to the labour market.

Teaching Quality and the Attainment of Basic Competencies

Keywords: Competencies, Quantitative Methods, School Effectiveness, Teaching/Instruction

Presenting Author:Boris Eckstein, University of Teacher Education St. Gallen, Switzerland; **Co-Author:**Andrea B. Erzinger, University of Berne, Switzerland; **Co-Author:**Christian Bruehwiler, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Giang Pham, Pädagogische Hochschule St.Gallen, Switzerland

The current national educational goals of Switzerland stipulate that nearly all students should have attained basic competencies in four subject areas at a certain time in their school career. However, the findings of the national large-scale assessment «UeGK» («Verification of the Attainment of Basic Competencies») in 2016 revealed that only 62.2% of Swiss students attained these basic competencies in mathematics at the end of compulsory education. Based on test and student questionnaire data of the UeGK 2016, this paper investigates the conditional probability of students' achievement of the mathematical basic competencies given their perception of instructional quality by means of logistic regression analyses. Effects of the following three teaching characteristics on students' achievement were analyzed: (i) instructional clarity; (ii) classroom disturbances; (iii) autonomy support. The students' socio-economic background was controlled for in the analyses, and effects of different school types were compared. Strongly summarized, the findings suggest that high quality teaching in the students' perception coincides with high probabilities that the students attain the mathematical basic competencies. In particular, the perceived degree of autonomy support matters more in schools with basic requirements, whereas the perceived amount of classroom disturbances has a larger effect in schools with enhanced requirements. Due to methodological limits of UeGK 2016 in investigating teaching effects, further research is needed to better understand these

findings.

Teaching reading comprehension in Austria: Do teachers do what science suggests?

Keywords: Competencies, Quantitative Methods, Reading Comprehension, Teaching/Instruction

Presenting Author:Marcel Illetschko, IQS - Institut zur Qualitätssicherung im österreichischen Schulwesen, Austria; **Co-Author:**Antonia Bachinger, Federal Institute for the Quality Assurance in the Austrian School System, IQS, Austria; **Co-Author:**Veronika Österbauer, IQS, Austria; **Co-Author:**Benedikt Winter, Federal Ministry of Education, Science and Research of Austria, Austria; **Co-Author:**Daniel Paasch, Federal Institute for the Quality Assurance in the Austrian School System, Austria

Rosebrock und Nix (2020) prominently stipulate for the German-speaking reading research world – based on decades of English-speaking reading research as merged in the report of the NRP (2000) – that the systematic teaching of reading comprehension has to be adjusted to the competence level of classes and individual students. They state that low-performing students especially benefit from guided repeated oral reading ("Lautleseverfahren"), whereas average- or high-performing students benefit from reading strategies training ("Lesestrategietraining") or instructional approaches that increase the amount of independent reading and the childrens' motivation for reading ("Leseanimation"). Therefore, this paper investigates, how reading is being taught in Austrian primary school classrooms and if it aligns to state-of-the-art research findings. The study combines student performance data and questionnaire data to show the connections between performance in reading comprehension and the teaching of reading comprehension in Austrian primary schools. These data sets derive from PIRLS (2006, 2011, and 2016) and the 2018 field test to the Austrian Education Standard Survey for German, 4th grade ("Bildungsstandardüberprüfung D4", "BIST-UE D4"). The findings suggest that there is almost no adaptation of the instructional methods used in teaching reading comprehension to class or student performance level in Austrian primary schools. The teaching of reading comprehension in Austrian primary schools thus lags 15 years behind the recommendations of the German-speaking research and almost 40 years behind the first studies in the English-speaking world.

Session S 5

26 August 2021 14:30 - 15:30

Session Room 8

Single Paper

Higher Education

Educational Psychology, Emotion and Affect

Keywords: Educational Psychology, Emotion and Affect, Higher Education, Mathematics, Problem Solving, Psychometrics

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion

Chairperson: Kateryna Holubinka, Germany

First and second year education-degree students' perceived stress and perceived lack of control

Keywords: Educational Psychology, Emotion and Affect, Higher Education, Psychometrics

Presenting Author:Inmaculada Martínez-García, University of Cadiz, Spain; **Co-Author:**Tine Nielsen, UCL University College, Denmark; **Co-Author:**Enrique Alastor, University of Cadiz, Spain

Stress in higher education students is an issue of growing concern, as it impacts quality of life and has been linked to increased risk of drop-out from education. Our aim was to investigate how stress was related to how far along education students were in their degree program, using the Spanish Perceived Stress Scale (PSS10). We expected that 1) First-year students would experience more perceived lack of control than students in their second year, and 2) second-year students would experience more perceived stress than the first year students. Participants were first and second-year students enrolled in three education degree programs at the University of Jaén (N=399). Prior to this, the psychometric properties of the well-established subscales of the PSS10; Perceived Stress (PS) and Perceived Lack of Control (PLC), were investigated using Rasch models. General linear models was used to analyze the resulting interval-level person-parameter estimates for each of the scale. Both for PS and PLC more complex patterns than predicted as interaction effects between degree year and gender were present for both scales and for the PS scale additionally between degree year and basis for admission. Male first-year students experienced less PLC than their second-year counterparts, while the opposite was found for the female students. Male second-year students experienced more PS than male first-year students, and most pronounced when admitted on a bachelor degree. Female second-year students admitted on a bachelor degree experienced more PS, while female second-year students admitted on professional training experienced less PS, than their first-year counterparts.

Beyond math anxiety: Mood Induction of positive emotions promotes higher scores in undergraduates

Keywords: Educational Psychology, Emotion and Affect, Mathematics, Problem Solving

Presenting Author:Diego Oswaldo Camacho Vega, Universidad Autónoma de Baja California, Mexico

Mathematics performance in higher education is considered an important topic that requires a worthwhile endeavor and handles important barriers. Limited research has examined the role of positive and negative emotions in conjunction with math anxiety and other relevant factors. The current study examined how a mood induction intervention helps to improve positive emotions in undergraduate students and to explore how these emotions work in higher vs lower-scored students during a math task. Additionally, we explore differences between groups regarding math anxiety, mathematics self-efficacy, students' attitude toward mathematics, and metacognitive judgments. A sample of 70 students participated in the study (N = 21 higher; N = 49 lower-scored). Results indicated that Velten's mood induction procedure promotes positive emotions in both groups, but the higher-scored group decreased their negative emotions significantly better than the lower-scored group during the math task. Also, significant differences were found between groups showing greater values for the higher-scored group in attitude toward mathematics, math anxiety, mathematics self-efficacy, and easy-of-learning judgment. The innovative aspects of this study are the evaluation of other emotions beyond math anxiety and the comparison of other relevant factors related to the level of math performance.

Exploring Math Anxiety Factors and Heart Rate When Students Fail in Solving a Math Problem

Keywords: Educational Psychology, Emotion and Affect, Higher Education, Mathematics

Presenting Author:Diego Oswaldo Camacho Vega, Universidad Autónoma de Baja California, Mexico; **Co-Author:**Gerardo Ramirez, Ball State University, United States

Many students suffer from math anxiety that can negatively impact their performance in math. But knowledge of the physiological markers of math anxiety is sparse. The main objective of this study is to determine changes in the heart rate of students who are math-anxious during math problem-solving. We measured math anxiety, math identity, and self-reported anxiety of N=122 college students. Students were also led through a challenging math puzzle that requires insight problem-solving. We measured heart rate during problem-solving using a mouse designed to take physiological readings. Results indicated that the heart rate increases are most pronounced among students who eventually fail to solve a math problem. Furthermore, higher heart rate was inversely related to lower math anxiety.

Session S 6

26 August 2021 14:30 - 15:30

Session Room 16

Single Paper

Assessment and Evaluation, Higher Education

Higher Education

Keywords: Assessment Methods and Tools, Collaborative Learning, Competencies, E-Learning/Online Learning, Higher Education, Multimedia Learning,

Quantitative Methods

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Bernardita Munoz Chereau, University College London, United Kingdom

Measuring medical students' communication competence: a video-based situational judgment test

Keywords: Assessment Methods and Tools, Competencies, Higher Education, Quantitative Methods

Presenting Author:Sabine Reiser, University of Erfurt, Germany; **Co-Author:**Laura Schacht, University of Erfurt, Germany; **Co-Author:**Eva Thomm, University of Erfurt, Germany; **Co-Author:**Kristina Schick, Technical University of Munich, Germany; **Co-Author:**Pascal Berberat, TUM Medical Education Center, Germany; **Co-Author:**Martin Gartmeier, Technical University of Munich (TUM), Germany; **Co-Author:**Johannes Bauer, University of Erfurt, Germany

Patient-physician communication is a daily task for doctors, for example during an initial consultation. Therefore it is important that medical communication competence (MCC) is fostered during medical studies. This study delivers results from the development and first evaluation of a video-based Situational Judgment Test (SJT) that measures medical students' basic MCC. The SJT was developed to align with established curricular standards and theoretical models of MCC. It assesses MCC along three dimensions: *advancing the content* of the encounter, *providing structure* of the conversation, and *building a relationship*. The first test-draft consisted of 14 video-based tasks, each with 15 embedded items. For the scoring of the test, an expert-based answer key was created based on experts' data ($N = 13$). Expert interviews ($N = 6$) were conducted to evaluate the SJT's content validity. To investigate the test's usability and acceptance, cognitive pre-tests with $N = 12$ and a pilot study with $N = 117$ medical students were carried out. The pilot study served also as a first evaluation of psychometric properties, especially reliability and its dependence on the applied scoring method (raw consensus vs. pairwise comparison scoring). Findings from experts' interviews, cognitive pre-tests, and the pilot study indicated good content validity and usability. We found high interrater agreement for the answer key (ICCs > .83). Moreover, internal consistencies were high for all three dimensions, independent of the scoring method (Cronbach's $\alpha \geq .86$). Barring further validation, these findings indicate that the SJT is a promising instrument to measure medical students' MCC.

Fostering medical communication through e-learning: Efficacy of video modelling and reflection.

Keywords: Competencies, E-Learning/Online Learning, Higher Education, Multimedia Learning

Presenting Author:Kristina Schick, Technical University of Munich, Germany; **Co-Author:**Laura Janssen, Technical University of Munich, Germany; **Co-Author:**Christina Figalist, Technical University of Munich, Germany; **Co-Author:**Sabine Reiser, University of Erfurt, Germany; **Co-Author:**Laura Schacht, University of Erfurt, Germany; **Co-Author:**Johannes Bauer, University of Erfurt, Germany; **Co-Author:**Pascal Berberat, TUM Medical Education Center, Germany; **Co-Author:**Martin Gartmeier, Technical University of Munich (TUM), Germany

Facilitating communication competence through video-based e-learning is an increasingly important didactic strategy in medical communication training. In this context, we compare two ways of using video examples to foster communication competence, video modelling and video reflection. Our study investigates which of the two approaches (or their combination) is more effective to train communication competence in an online format. We conducted a randomized controlled trial with three intervention groups (video modelling, video reflection and a combination of both approaches) using a pre-post test design. The pre-post test was a video-based situational judgement test measuring medical communication competence. We will use planned contrasts to analyze the differences within and between the intervention groups as well as the differences between the intervention and the wait list control groups. Data collection was finished at the end of December 2020. Preliminary results are promising regarding the efficacy of our training method: In a pilot study, the intervention group achieved higher test scores than the control group. On this basis, we expect our main study to provide information about how effective the different didactic approaches are to foster communication competence and which role personal resources like pre-knowledge, self-efficacy or reflection ability play in this context.

Interpreter-mediated consultations with simulated patients – a digital solution

Keywords: Collaborative Learning, Competencies, E-Learning/Online Learning, Higher Education

Presenting Author:Mini Ruiz, Karolinska Institutet, Sweden; **Co-Author:**Anna Sundelin, Karolinska Institute, Sweden

Interpreter mediated communication skills are required in many domains. In healthcare it is important for providing equal care. Interpreter-mediated consultations are very common in clinical practice and medical students in Sweden mainly observe these consultations during clinical rotations. Interpreter-mediated consultations require both theoretical knowledge and practical training. In fostering and assessing interpreter-mediated communication skills, interprofessional learning activities give the students an opportunity to practice and reflect upon the interpreter-mediated consultation. A learning activity where interpreter students and medical students practice and reflect upon interpreter-mediated consultations has been developed as a joint activity between the interpreter school at Stockholm University (TÖI) and the medical program at the Karolinska Institutet since 2020. Due to Covid-19 the learning activity was converted to digital and student based, with no teachers present. A voluntary survey was conducted that indicate that the learning activity was sought for since only 1/3 if the medical students had had the opportunity to have an Interpreter-mediated consultation prior to this training. More so, the interprofessional reflections were highly valued in both medical and interpreter students. We show that interpreter-mediated communication skills can be developed through digital consultations and illustrate the benefits of interprofessional educational opportunities.

Session S 7

26 August 2021 14:30 - 15:30

Session Room 14

Single Paper

Cognitive Science

Cognitive Skills in Mathematics

Keywords: Cognitive Development, Cognitive Skills, Developmental Processes, Language (L1/Standard Language), Mathematics, Primary Education

Interest group: SIG 22 - Neuroscience and Education

Chairperson: Winnie-Karen Giera, Germany

Adaptive use of subtraction by addition by 4th- to 6th-graders in multidigit subtraction.

Keywords: Cognitive Skills, Developmental Processes, Mathematics, Primary Education

Presenting Author:Stijn Van Der Auwera, KU Leuven, Centre for Instructional Psychology and -Technology, Belgium; **Co-Author:**Joke Torbevens, KU Leuven, Belgium; **Co-Author:**Bert De Smedt, KU Leuven, Belgium; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium

This study applied the choice/no-choice method to examine the adaptive use of direct subtraction (DS) and subtraction by addition (SBA) when solving multidigit subtractions in a group of 4th- to 6th-graders from varying mathematical achievement groups, as well as the relationship between children's strategy adaptivity and task performance. We conducted this study in Flanders, where mathematics instruction focuses on the routine mastery of DS. We defined strategy adaptivity on the basis of both numerical and subject characteristics. The choice/no-choice method used to investigate adaptivity in this study, consisted of one choice condition (choice between DS or SBA on each item) and two no-choice conditions (mandatory use of either DS or SBA on all items). In each condition, children received five subtractions with a small difference (SD; e.g., 903–886=?) and five subtractions with a large difference (LD; e.g., 734–47=?) between the minuend and the subtrahend. All children showed adaptivity for numerical characteristics, as they used more SBA on SD subtractions, except the lowest achievement group. An additional latent class analysis (LCA) revealed that 46% of the children had an adaptive strategy profile regarding numerical characteristics, with no significant differences between grades or mathematical achievement groups. Turning to adaptivity for subject characteristics, all children were adaptive for their own solution speed, while adaptivity for one's own strategy accuracy was only observed in the 6th-graders. Finally, children with an adaptive strategy profile, based on the LCA, performed most accurate and fastest on the task in which they adaptively switched between strategies.

Exploring relations between EF and math: Implications of modeling on research, theory, and practice

Keywords: Cognitive Development, Cognitive Skills, Developmental Processes, Mathematics

Presenting Author: Andrew Ribner, University of Pittsburgh, United States

Extensive evidence has suggested executive function (EF) and math abilities are robustly related throughout schooling. However, different methods of statistical modeling reveal different patterns of relations. Indeed, different modeling approaches yield such disparate results that one could conclude either that EF and math have substantial directional or bidirectional/transactional relations such one can play a compensatory role for the other or one could conclude that there is no meaningful relation between them when considering other within-person characteristics. Modeling choices and interpretations thereof can have drastic implications for the development of further research, theory, and practice. Here, we seek to better understand the (bi)directionality of associations between EF and math and growth therein and, indeed, whether one can conclusively assume relations at all.

This study will use data from two prospective, longitudinal studies of child development. The first will be the kindergarten through second grade waves of the Early Childhood Longitudinal Study-Kindergarten Cohort 2010-11—a nationally-representative study of over 18,000 children across the US. The second will be the Family Life Project—a study of nearly 1,300 children from primarily low-income families in non-urban counties of Pennsylvania and North Carolina with a particular focus on measurement of EF. Associations will be tested using various approaches to modeling change over time, including cross-lagged panel models, latent growth models, parallel process models, and growth mixture models to explore co-occurring growth patterns. Implications for further research, theory, and practice will be discussed.

Understanding longitudinal relationships between linguistic, mathematical, and working memory skills

Keywords: Cognitive Skills, Developmental Processes, Language (L1/Standard Language), Mathematics

Presenting Author: Nurit Viesel-Nordmeyer, Technische Universität Dortmund, Germany; **Co-Author:** Ute Ritterfeld, TU Dortmund University, Germany; **Co-Author:** Carina Lüke, University of Würzburg, Germany; **Co-Author:** Camilla Crashaw, TU Dortmund University, Germany; **Co-Author:** Anja Starke, University of Bremen, Germany

Language plays an important role in mathematical learning spanning pre- and primary-school age. Both academic skills also seem to be closely related to the performances of working memory. It can be further assumed, that previous knowledge in linguistics and mathematics facilitate knowledge building by relieving working memory capacity.

Using longitudinal data ($n = 43$, biannual surveys), we aim to examine developmental interdependencies between linguistic, mathematical and working memory skills in more detail. Specifically, we are investigating in which way different working memory components and linguistic resp. mathematical skills are related during pre- and primary school age. Moreover, we are investigating which role this relational pattern plays in the developmental relationship between linguistic and mathematical skills. Finally, we are examining whether specific measurements of working memory components as well as different age spans make a difference for the relationships between linguistic, mathematical, and working memory skills.

Beyond the fundamental influences of linguistic skills on mathematical learning between the ages 4 to 6, mediation analysis revealed reciprocal influences between verbal working memory and mathematical resp. grammar skills in a longitudinal way. Furthermore, verbal and central working memory components functioned as mediators for comprehensive linguistic skills on mathematical learning, while grammatical comprehension specifically mediated central executive effects on mathematical skills at school entry. Finally, verbal and central executive working memory effects, measured by digit span, prevail most strongly.

The relevance of these results for a better comprehension of comprehensive linguistic and working memory parameters within the mathematical learning process will be discussed.

Session S 8

26 August 2021 14:30 - 15:30

Session Room 4

Single Paper

Assessment and Evaluation, Motivational, Social and Affective Processes

Motivation and Self-efficacy

Keywords: Attitudes and Beliefs, Cognitive Skills, Motivation, Parental Involvement in Learning, Reasoning, Secondary Education, Self-efficacy, Writing/Literacy

Interest group: SIG 01 - Assessment and Evaluation, SIG 08 - Motivation and Emotion, SIG 12 - Writing

Chairperson: Sina Fackler, Germany

Examining structural relations among motivation, behavior, and performance in writing

Keywords: Attitudes and Beliefs, Motivation, Self-efficacy, Writing/Literacy

Presenting Author: Ana Camacho, University of Porto and Polytechnic Institute of Porto, Portugal; **Co-Author:** Rui Alexandre Alves, University of Porto, Portugal; **Co-Author:** Fien De Smedt, Ghent University, Belgium; **Co-Author:** Pietro Boscolo, Università di Padova, Italy; **Co-Author:** Hilde Van Keer, Ghent University, Belgium

Writing is a particularly demanding activity, which poses unique motivational challenges for students. This study sought to examine the contribution of writing motivation and writing frequency (an understudied variable in writing research) to students' writing performance. The objectives were twofold: a) examining structural relations among two motivational variables (i.e., self-efficacy and attitudes), a behavioural variable (i.e., writing frequency), and writing performance; b) analysing whether and how these relations vary across two text genres (viz., narrative text and opinion text) and across two educational levels (i.e., students in grades 5-6 and grades 7-8). Six hundred and five Portuguese students from grades 5 to 8 participated in this study. Students filled in self-report scales and wrote narrative and opinion texts. We conducted multiple-group structural equation modeling to analyse the data. The results showed that for narrative texts, digital writing frequency was significantly associated with text quality for students in grades 7-8, but this relation was not significant in students from grades 5-6. Attitudes were associated with literary and digital writing frequency across educational levels. Additionally, both attitudes and self-efficacy for self-regulation made a direct contribution to narrative text quality across educational levels. As for opinion texts, no significant educational level differences emerged. Again, attitudes contributed to literary and digital writing frequency as well as to opinion text quality across educational levels. This study underlines the pivotal role of motivational variables—especially attitudes—to students' writing performance.

The impact of individual and parental factors on the job satisfaction of adolescents

Keywords: Motivation, Parental Involvement in Learning, Secondary Education, Self-efficacy

Presenting Author: Silke Luttenberger, University College of Teacher Education Styria, Austria; **Co-Author:** Manuela Paechter, University of Graz, Austria

Individual career choice behavior takes place in an ongoing developmental process in which contextual variables may support or hinder the career choice process. The current longitudinal study investigates this process and focuses on the interaction of individual variables with adolescent-parent congruence on the job satisfaction of adolescents. Altogether, 430 students, mostly fifteen years old, from sixteen pre-vocational schools in Austria took part in a survey on self-efficacy, outcome expectations, and adolescent-parent congruence in career aspiration (t1), career planning (t2), and job satisfaction after finishing grade 9 (t3). With this design, career decision processes ranging over the last school year before starting an apprenticeship (t1 and t2) and the start of an apprenticeship (t3) were captured. In general, results showed changes and developments of self-efficacy and outcome expectations in the crucial school year of grade nine and emphasize the differentiated impact of adolescent-parent congruence on career choice development as well as on job satisfaction. Higher agreements between adolescents and parental career aspirations and planning foster later job satisfaction. The results advise research and counselling to consider congruence between adolescents and their parents as proximal contextual influence factors in career choice development.

Exploring inductive reasoning, scientific reasoning and science motivation in Vietnam students

Keywords: Cognitive Skills, Motivation, Reasoning, Self-efficacy

Presenting Author: De Van Vo, University of Szeged, Doctoral School of Education, Hungary

The aims of this study are to explore the patterns of inductive reasoning, scientific reasoning and science motivation of students and their relationships in different grade levels. The study assessed 598 students selected randomly from 6th, 8th, 10th and 11th grades in six public schools in Vietnam. The adapted inductive reasoning test included nonverbal analogies and series completions tasks. The scientific reasoning test covered conservation, classification, analogies with discipline content, proportional reasoning, and correlational reasoning. The 22-item questionnaire was adapted to measure five scales of students' science motivation. The results from confirmatory factor analysis revealed that the models fit well to data in the IR test ($CFI=.902$, $RMSEA=.041$, $SRMR=.043$), SR test ($CFI=.918$, $RMSEA=.028$, $SRMR=.034$), and SM questionnaire ($CFI=.907$, $RMSEA=.056$, $SRMR=.050$). Students showed a gradual progress on reasoning skills, but their motivation in learning science tended to decline across grade levels. Students performed better on the inductive reasoning test than they did on scientific reasoning test, but their developmental changes had the same pattern. No significant difference was found between boys and girls on inductive reasoning, scientific reasoning and science motivation. Furthermore, a positive correlation was discovered between inductive reasoning and scientific reasoning, but science motivation seemed not to associate with inductive reasoning and scientific reasoning. The implications for enhancing inductive reasoning, scientific reasoning and science motivation of students are also discussed.

Session S 9

26 August 2021 14:30 - 15:30

Session Room 6

Single Paper

Learning and Instructional Technology

Educational Technology

Keywords: Collaborative Learning, Computer-assisted Learning, Educational Psychology, Educational Technology, In-service Teacher Education, Instructional Design, Learning Technologies, Science Education

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Felipe López, Pontificia Universidad Católica de Chile, Chile

Scaffolding augmented reality learning: A systematic review of the literature

Keywords: Computer-assisted Learning, Educational Technology, Instructional Design, Learning Technologies

Presenting Author: Yiannis Georgiou, Cyprus University of Technology / Cyprus Center for Environmental Research & Education, Cyprus; **Co-Author:** Eleni Kyza, Cyprus University of Technology, Cyprus

Scaffolding is crucial in Augmented Reality (AR) learning activities, as it can help students balance their attention between the digital and the real, and create opportunities to deepen understanding. In this context, empirical studies have investigated various scaffolding mechanisms to support AR learning; however, reported findings are disjointed. This contribution presents a systematic review of 19 empirical studies on scaffolding AR learning, covering the last fifteen years (2005-2020). The synthesis of the reviewed studies has resulted in a conjecture map, guiding research on scaffolding designs embedded in AR learning environments and their impact on students' learning. The conjecture map shows that, in most of the cases, the reviewed design features scaffolded students toward the intended enactment processes and learning outcomes. However, the conjecture map also indicates the need for future research to examine the less investigated scaffolding designs as well as to examine inconclusive relationships regarding the scaffolding designs, the mediating processes and the learning outcomes. Results also highlight the need to compare the affordances and limitations of the available scaffolding designs as well as their synergistic effect to reinforce the desirable mediating processes and learning outcomes.

Explaining science teachers' intentions to use augmented reality

Keywords: Educational Psychology, Educational Technology, In-service Teacher Education, Science Education

Presenting Author: Juan Garzón, Universidad Católica de Oriente, Colombia; **Co-Author:** Hüseyin Ateş, Kırşehir Ahi Evran University, Turkey

The increased use of augmented reality (AR) in science education corresponds with the affordability of this technology to improve educational settings. This technology has the potential to improve learning gains, promote collaboration, and increase motivation to learn. However, the extent to which science teachers take advantage of these potentials depends on their perceptions of AR and their intentions to use it. Accordingly, this study aimed to identify the factors that influence science teachers' intentions to use AR by merging the Theory of Planned Behavior and the Unified Theory of Acceptance and Use of Technology 2. Our model includes nine hypotheses that were tested with 274 science teachers in Turkey. All hypotheses within the model were found to positively influence teachers' intentions. Specifically, perceived behavioral control and hedonic motivation were the most influential factors. Finally, the study discusses implications for theory and practice as well as some recommendations for future research.

Collaborative and individual learning in an augmented reality escape room game

Keywords: Collaborative Learning, Educational Technology, Instructional Design, Learning Technologies

Presenting Author: Josef Buchner, University of Duisburg-Essen, Germany; **Co-Author:** Michael Kerres, University of Duisburg-Essen, Germany

Augmented Reality technology provides immersive learning environments that support an intensive engagement of learners with instructional material. However, the role of immersion for students' learning is still under discussion as previous studies provide contradictory results. On the one hand, immersion can be related to higher learning outcomes and emotional engagement. On the other hand, immersion can be counterproductive to learning as it can distract and overwhelm learners. Several strategies to guide students' learning in highly immersive learning environments have been investigated in recent years, such as generative learning activities (e.g., summarizing). In this research, we argue that collaboration might serve as a helpful strategy to support students learning with immersive technologies like AR. In a randomized controlled field trial, students either played an AR escape room game on learning about fake news individually ($n = 28$) or collaboratively ($n = 32$). In the collaborative condition learners outperformed the individual learners significantly on a post knowledge test, but no differences were found on a transfer test. Collaborative learners reported significantly lower degrees of engrossment and total immersion, which are the higher levels of immersion used in this study. A linear regression model showed that the highest level of immersion ("total immersion") negatively predicted knowledge acquisition. Results are discussed considering the immersion principle in multimedia learning.

Session S 10

26 August 2021 14:30 - 15:30

Session Room 12

Single Paper

Educational Policy and Systems, Motivational, Social and Affective Processes

Developmental Processes

Keywords: Communities of Practice, Developmental Processes, Emotion and Affect, Social Development, Survey Research, Synergies between Learning; Teaching and Research, Workplace Learning

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 14 - Learning and Professional Development, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Lea Eldstål-Ahrens, University of Gothenburg, Sweden

Development of students' social support profiles and association with students' study wellbeing

Keywords: Developmental Processes, Emotion and Affect, Social Development, Survey Research

Presenting Author:Sanna Ulmanen, Tampere University, Finland; **Co-Author:**Tiina Soini-Ikonen, University of Tampere, Finland; **Co-Author:**Janne Pietarinen, University of Eastern Finland, Finland; **Co-Author:**Kirsi Pyhältö, University of Helsinki, Finland

It is suggested that effective social support from teachers, peers and guardians is a key to promoting students' study well-being at school. However, little longitudinal research has examined the implications of distinctive combinations of social support for students' study wellbeing. To address this limitation, we measured multiple dimensions of school-related social support (teacher, peer, and guardian support), study engagement and study burnout in a sample of 1545 Finnish lower secondary school students in Grades 7, 8 and 9. Latent transition analyses identified a 6-profile solution for each wave of data and revealed substantial inequality in perceived social support. Firstly, we found four profiles where social support from all three sources was experienced either on high, moderate, low, or very low level labelled as *Fully supported* (33%), *Moderately supported* (43%), *Weakly supported* (13%) and *Isolated* (3%). In addition to these, two "mixed profiles", where a low level of social support from one source was combined with moderate levels of social support from two other sources were found. These two profiles were labelled as *Teacher-Guardian Supported* (5%) and *Peer supported* (3%) profiles. The profiles differed from each other in terms of study engagement and study burnout suggesting that social support from specific partners has a somewhat different effect on features of students' study wellbeing. Moreover, the results showed that the experiences of school-related social support and study wellbeing are prone to change highlighting the importance of each source of support throughout the students' school path.

Brokerage and School Improvement: A Systematic Review of Contexts, Theories, Methods and Effects

Keywords: Communities of Practice, Developmental Processes, Synergies between Learning; Teaching and Research, Workplace Learning

Presenting Author:Beat Rechsteiner, University of Zurich, Switzerland; **Co-Author:**Andrea Wullschleger, University of Zurich, Switzerland; **Co-Author:**Katharina Maag Merki, University of Zurich, Switzerland; **Co-Author:**Eva Kyndt, University of Antwerp, Belgium

The loosely coupled structure of educational systems makes school improvement a demanding endeavor. Various stakeholders on the classroom, school and system levels with different backgrounds and interests are involved in further developing educational practice. Bridging gaps between these actors through knowledge mobilization and by supporting capacity building is challenging. The brokerage concept enables the analysis of success and failure in bridging gaps. Previous research has shown the benefits and costs of brokerage in developing organizational practice. However, there is no systematic overview of brokerage in school improvement research specifically. Therefore, 34 articles with a focus on brokerage and school improvement were analyzed in a systematic literature review. The analysis focused on the selected studies' contexts, theoretical frameworks, methodological approaches and empirical evidence. The results indicate that the existing literature about brokerage in school improvement research is fairly heterogeneous with an emphasis on the role of teachers and principals in brokerage activities. Most studies approached brokerage with theoretical frameworks relating to knowledge mobilization and chose qualitative study designs. Brokerage is seen as an aspect that has a high potential to foster educational change. However, there is generally only little evidence of effective brokerage. Furthermore, tensions between legitimacy and credibility when bridging gaps are outlined.

The influence of emotional challenges on students' professional becoming – a comparative study

Keywords: Communities of Practice, Developmental Processes, Emotion and Affect, Workplace Learning

Presenting Author:Linda Barman, The Royal Institute of Technology (KTH), Sweden; **Co-Author:**Maria Weurlander, Stockholm University, Sweden; **Co-Author:**Henrik Lindqvist, Linköping University, Sweden; **Co-Author:**AnnaLena Lönn, Karolinska Institutet, Sweden; **Co-Author:**Astrid Seeberger, Karolinska Institutet, Sweden; **Co-Author:**Håkan Hult, Karolinska Institutet, Sweden; **Co-Author:**Robert Thornberg, Linköping University, Sweden; **Co-Author:**Annika Wernerson, Karolinska Institutet, Sweden

This study addresses medical students' and student teachers' professional becoming, aiming to gain a deeper understanding of how emotional challenging situations during work-based education may influence students' professional becoming. A qualitative comparative analysis of eight focus group interviews was conducted. Guided by our socio-culture approach, Wenger's, theory of communities of practice, was used to illuminate the students' experiences, and how emotional challenging situations played a role when the students learned to enact the cultural codes and use the tools that signifies their future profession. The findings show how the students from these two different professions' education make sense of their future professional role related to emotional challenging situations. Both student groups broadened their view of what it means to be professional and described situations where drawing boundaries connected to human relations and patients', and pupils' life-situations were emotional challenging. Furthermore, the students professional becoming and views of their future role were influenced by challenging cultures and norms enacted within the community of practice, and doubts and worries regarding professional legitimacy, as well as decision-making.

Session S 11

26 August 2021 14:30 - 15:30

Session Room 1

Single Paper

Cognitive Science, Higher Education

Reasoning in Science Education

Keywords: Cognitive Skills, Competencies, Conceptual Change, Higher Education, Physical Sciences, Reasoning, Science Education

Interest group: SIG 03 - Conceptual Change

Chairperson: ANASTASIA SKARPETI, NTNU - Norwegian University of Science and Technology, Norway

Intuitive Rules in the Physic's Laboratory

Keywords: Conceptual Change, Higher Education, Physical Sciences, Reasoning

Presenting Author:Ida Kukliansky, Ruppin Academic Center, Israel

The present study uses the intuitive rules theory as a framework to examine whether some of the difficulties in dealing with errors and uncertainties in the data analysis process in the undergraduate physics laboratory can stem from use of intuitive rules by the students. The study also examines the relationship between the use of intuitive rules and laboratory experience level. The participants were 52 students, having different laboratory experience. The results show that students used the More A-More B, as well as the Same A-Same B, intuitive rules for comparison tasks analyzing data in the physics laboratory. Moreover, students with less laboratory experience used the intuitive rules more frequently than students with more laboratory experience. Understanding the influence of intuitive rules on students' performance, when dealing with experimental data, may be a great help to educators in designing better learning environments.

Scientific reasoning and science knowledge: Findings from a 4-year longitudinal study in high school

Keywords: Cognitive Skills, Competencies, Reasoning, Science Education

Presenting Author:Christopher Osterhaus, University of Vechta, Germany; **Co-Author:**Susanne Koerber, University of Education Freiburg, Germany; **Co-Author:**Kristin Nyberg, University of Education Freiburg, Germany; **Co-Author:**Beate Sodian, Ludwig-Maximilians-Universität (LMU), Germany

Are scientific reasoning and students' acquisition of science knowledge related? A longitudinal study with 501 students (250 girls; mean age in Grade 6: 12 years, 4 months) investigated the bidirectional relations between these two constructs from Grade 6 to Grade 10. Scientific reasoning was measured with a 21-item instrument that assesses students' experimentation and data-interpretation skills, as well as their understanding of the nature of science (Osterhaus et al., 2020). Science knowledge was measured with 29 items that were adapted from the Trends in Mathematics and Science Study (Baumert et al., 1999). These items assess students' knowledge in mechanics, electricity and magnetism, thermodynamics, and on waves and oscillations. Our results revealed significant relations between scientific reasoning and science knowledge that were independent of students' intelligence and language abilities. A cross-lagged panel analysis of our longitudinal data revealed that individual differences in scientific reasoning and science knowledge were relatively stable over the course of high

school. In addition to the autoregressive effects, we found significant bidirectional associations between scientific reasoning and science knowledge. The association between scientific reasoning in Grade 8 and science knowledge in Grade 9 was particularly strong. In Grades 8 and 9, German high schools teach many of the topics that were addressed in our measure of science knowledge, and so this finding supports the hypothesis that students' scientific reasoning may promote their acquisition of new science knowledge. We discuss our findings with respect to the relevance of fostering scientific reasoning in STEM education in high schools.

Session S 12

26 August 2021 14:30 - 15:30

Session Room 10

Single Paper

Assessment and Evaluation

Assessment and Evaluation

Keywords: Assessment Methods and Tools, Competencies, Peer Interaction, Qualitative Methods, School Effectiveness, Teacher Professional Development, Vocational Education, Writing/Literacy

Interest group: SIG 01 - Assessment and Evaluation, SIG 14 - Learning and Professional Development

Chairperson: Marijke Veugen, Wageningen University and Research Centre, Netherlands

Teachers' conceptions of assessment literacy

Keywords: Assessment Methods and Tools, Qualitative Methods, Teacher Professional Development, Vocational Education

Presenting Author:Kitty Meijer, HU University of Applied Sciences Utrecht; Open University of the Netherlands, Netherlands; **Co-Author:**Liesbeth Baartman, Utrecht University of Applied Sciences, Netherlands; **Co-Author:**Marjan Vermeulen, Heerlen Open Universiteit, Netherlands; **Co-Author:**Elly de Brujin, Hogeschool Utrecht / OU, Netherlands

AbstractThis study provides a further elaboration of the construct of assessment literacy by exploring teachers' conceptions of assessment literacy based upon their daily experiences. Teachers' assessment literacy affects the quality of assessments and therefore is an essential part of teachers' competences. Recent studies define assessment literacy as a dynamic, contextual, and social construct, situated in practice and mediated by teachers' identity and conceptions of assessment. Eleven focus group interviews were conducted online within the context of Dutch higher professional education between June and December 2020. The method of template analysis was used to develop a template of teachers' conceptions of assessment literacy. Preliminary results indicate that teachers perceive the ability to adapt to changes in the environment as a dimension of assessment literacy. Besides, they perceive assessment literacy as depending on the traditions and norms associated with a particular vocation and their own educational program as well as depending on organizational factors such as different assessment roles, tasks, and responsibilities. Therefore, they perceive that adopting different perspectives is part of assessment literacy. Furthermore, due to the judgmental nature of assessment, teachers experience limited room to experiment with assessments. Finally, teachers perceive a body of knowledge and skills to be an essential part of assessment literacy.

Receiver proactive roles and natures of feedback in dialogic peer feedback

Keywords: Assessment Methods and Tools, Peer Interaction, Qualitative Methods, Writing/Literacy

Presenting Author:Qiyun Zhu, Guangdong University of Foreign Studies, China

Feedback is increasingly reconceptualised as dialogic interaction that accentuates the fundamental role of receiver in making the process effective. However, the active role of receiver during peer interaction is under-researched. Contextualised in a writing curriculum for learners of English as a foreign language in a Chinese university, the study adopted a qualitative research design to explore different receiver roles during oral peer feedback processes and its association with the natures of feedback message. Thematic and interactional analysis were conducted on student self-reported data and oral discussion. The receiver displayed different shades of proactivity along a continuum, ranging from respondent, verifier, explicator, negotiator, seeker and generator. Actively engaged in the oral discussion, the receiver helped shape the types and depths of feedback. The study contributes to an enhanced understanding of the extent of receiver proactivity and how the receiver engagement in peer feedback processes affects feedback quality. It also bears important implications for the design of peer feedback.

Assessment Literacy, Data Use, and Teacher Decision-making: A Feasible Balance?

Keywords: Assessment Methods and Tools, Competencies, School Effectiveness, Teacher Professional Development

Presenting Author:Serafina Pastore, University of Bari, Italy

Together with the spread of standardized assessment, there is a relevant growth of systems and technologies aimed to store, manage, analyze, and report data on student performance.

Despite the broad recognition of advisability of using data on student learning for decision-making (at educational policy and practice levels) data use of instructional decision making is not widely recognized Few research studies, indeed, have tried to understand what schools and teachers do with data on student learning.

Given these assumptions, the present papers reports on an attempt realized in the Italian school system to implement an interim assessment. A light professional development path has been designed and implemented with the aim to improve teacher assessment literacy, data use, and instructional decision-making.

The teacher inquiry path, through the implementation of the interim assessment system, involved 37 primary school teachers (and 404 students).

The present paper reports the main aspects of this path and critically reflects on how to support teacher assessment literacy and data use.

Session S 13

26 August 2021 14:30 - 15:30

Session Room 7

Single Paper

Learning and Social Interaction

Content Analysis

Keywords: Content Analysis, Cooperative/Collaborative Learning, Cultural Psychology, Educational Psychology, Higher Education, Interdisciplinary, Problem-based Learning, Qualitative Methods

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Engin Ader, Bogazici University, Turkey

Standing up for physically active learning.

Keywords: Content Analysis, Higher Education, Interdisciplinary, Problem-based Learning

Presenting Author:HQ Chim, Maastricht University, Netherlands

Background: In most educational settings, it is the norm for students to spend long hours being sedentary, despite the associated health risks. Unless being sedentary is beneficial for learning, there is no reason to continue designing educational settings that enforce such a norm. In this study, we compared the effects of sitting vs. standing in tutorial group meetings on learning among first-year undergraduate students.**Methods:** Ninety-six participants were randomly

allocated to a Sit or Stand group, with 2-hour tutorial group meetings scheduled for once or twice per week, across nine weeks. These tutorial group meetings were conducted according to the Problem-Based Learning instructional model. Concept maps were administered to measure the participants' prior knowledge, knowledge learnt from tutorial discussions, and two weeks after the tutorial discussions. Results: Both the Sit and Stand group had an overall similar concept map performance. Tutorial interactions were analyzed based on the use of learning-oriented interactions, and once again, no group differences were observed. In the end, both groups performed similarly on their course exam. Implications: Considering the health risks associated with prolonged sedentary behavior, offering standing tutorial group meetings to undergraduate students is a recommended solution to break up prolonged sedentary behavior and encourage more physical activity, while maintaining the learning performance of students. This study is relevant to the EARLI community as it utilizes a comprehensive measure of learning that includes the constructive and social-constructive approaches, embedded within real tutorial meetings, and sheds light on how education innovations may change future classrooms.

Tensions faced by social workers accompanying refugees' professional integration in Switzerland

Keywords: Content Analysis, Cultural Psychology, Educational Psychology, Qualitative Methods

Presenting Author: Stéphanie Cardoso, Educational Sciences Section, Switzerland

Migrants' integration has been a major political and economic concern for several years in Switzerland, but refugees still have trouble reaching social support and professional integration programs. Furthermore, integration practices are heterogeneous among the country, situated in an unsupportive political context, given that the majority party in Switzerland is a right populist party. Nevertheless, social workers play a fundamental role in helping refugees access the labour market. While still facing important challenges regarding the professionalization of their activity, social workers find themselves in constraining work environments and face conflicting missions: defending human rights, helping vulnerable populations and accompany professional integration on the one hand; participating in social control, selection and assessment procedures, on the other hand. In this context, how do social workers accompany refugees trying to find a job in Switzerland? We conducted a qualitative research on professional practices of social workers in the field of refugees' integration in the Canton de Vaud (French-speaking part of Switzerland) and the tensions they face. Seven individual semi-structured interviews were conducted, and analysed with a discursive method. Results show that social workers have trouble defining their missions and are often confronted to requests out of their sphere of competence. Their activity is described as complicated and large. On the other hand, social workers emphasize their passion and pleasure doing the job, which provides them with a sense of purpose.

A review of student-created teaching materials: Types, data sources and learning-related matters

Keywords: Content Analysis, Cooperative/Collaborative Learning, Educational Psychology, Interdisciplinary

Presenting Author: Jesús Ribosa, UAB Universitat Autònoma de Barcelona, Spain; **Co-Author:** David Duran Gisbert, Universitat Autònoma de Barcelona, Spain

Student-generated artefacts may adopt many different forms and respond to several purposes. Some of them might take the form of teaching materials. This literature review focuses on any type of product created by students as teaching materials, and both the selection and review of articles are based on a learning-by-teaching perspective. Three research questions are addressed: 1) What types of products do students generate as teaching materials?, 2) What sources of information do studies collect data from?, and 3) What learning-related matters do studies analyze? A total of 202 articles were selected from four databases and analyzed. As regards the first research question, four types of student-generated teaching materials were identified: audio/visual materials, questions, textbooks, and educational games. Concerning the second research question, four sources of information were identified: participants' perceptions, product creation, learning outcomes, and use of the product. In reference to the third research question, the studies focused on both the socio-cognitive and motivational dimensions of learning, considering four learning-related matters: subject matter, cross-curricular competences, academic emotions, and engagement.

Session S 14

26 August 2021 14:30 - 15:30

Session Room 18

Single Paper

Higher Education, Learning and Instructional Technology

Game-based Learning

Keywords: Experimental Studies, Game-based Learning, Higher Education, Learning Analytics, Learning Technologies, Reflection, Self-regulation

Interest group: SIG 06 - Instructional Design, SIG 14 - Learning and Professional Development, SIG 16 - Metacognition

Chairperson: Perry Klein, The University of Western Ontario, Canada

Self-reflection increases information usage in a digital serious game

Keywords: Experimental Studies, Game-based Learning, Learning Analytics, Reflection

Presenting Author: Johannes Steinrücke, University of Twente, Netherlands; **Co-Author:** Bernard Veldkamp, University of Twente, Netherlands; **Co-Author:** Ton de Jong, University of Twente, Netherlands

Using information is crucial in crisis management decision-making. Decision-makers have to combine previous experiences, with actual, contextual information to guarantee a well-informed decision-making process. To train crisis management decision-makers in selecting and using contextual information, digital serious games can be a useful tool, since they are an accessible training method which can be used more frequently than traditional analog training methods. This study investigated the effect of a self-reflection moment on information usage in a digital serious game for crisis management decision making. The self-reflection moment allowed the trainees to engage in a social comparison between themselves and other (previous) trainees on the selection and inclusion of information available from different advisors during a crisis situation. It was found that trainees who experienced such a self-reflection moment increased the number and diversity of consulted information items after engaging in self-reflection compared to trainees who did not have such a self-reflection moment included in their training, indicating that self-reflection can be valuable in digital serious games for decision-making training.

Indicators for adaptive scaffolding in a medical emergency game

Keywords: Game-based Learning, Higher Education, Learning Analytics, Self-regulation

Presenting Author: Tjitske Faber, Erasmus MC, Netherlands; **Co-Author:** Mary E.W. Dankbaar, Erasmus MC, Netherlands; **Co-Author:** Rob Kickert, Erasmus University Rotterdam, Netherlands; **Co-Author:** Walter van den Broek, Erasmus MC, Netherlands; **Co-Author:** Jeroen Van Merriënboer, Maastricht University, Netherlands

Introduction In game-based learning (GBL), scaffolding can improve knowledge and skill acquisition. Games can give the player control over the environment and provide adaptive responses, changing in response to the players' actions. These characteristics raise the questions (1) how to determine how much scaffolding is needed, and (2) who should control the scaffolding, the learner or the system? We explore the relevance of in-game behavioral data and self-regulated learning (SRL) skills for students' performance in a medical emergency game. Methods Fourth-year medical students played a medical emergency game. Using linear multilevel models we investigated the value of in-game behavior data. We measured SRL using the Motivated Strategies for Learning Questionnaire (MSLQ) and SRL-microanalysis (SRL-MA) questions adapted to the context. Results We analyzed 116 sessions by 26 students. Performing interventions, requesting diagnostics, and systematicity (adherence to ABCDE structure) were in-game behavioral indicators associated with higher performance. A high level of SRL on the MSLQ, self-evaluation after the first session, repeating scenarios, and using a checklist correlated with better performance. Students showing lower systematicity profit more from the checklist than students showing higher systematicity. Conclusion Traces associated with performance were requesting diagnostics and systematicity, indicators of the players' level of expertise. Relevant SRL measures were checklist use and MSLQ score, indicating capability to self-regulate learning. These players will likely benefit from second-order scaffolding and can handle more freedom, opposed to first-order scaffolding and system-decided learning paths. Future research should focus on comparing system-controlled versus user-controlled

adaptive scaffolding.

Do Learning Gains and Problem-Solving Success Predict Reflection Duration in Game-based Learning?

Keywords: Game-based Learning, Learning Technologies, Reflection, Self-regulation

Presenting Author:Daryn Dever, University of Central Florida, United States; **Co-Author:**Roger Azevedo, University of Central Florida, United States

It is essential for learners to engage in self-regulation via reflecting on progress during game-based learning to monitor and assess their understanding and knowledge. This study examines 71 middle-school students as they reflect while learning with Crystal Island, a microbiology game-based learning environment (GBLE) that requires learners to diagnose a disease infecting island residents and reflect on their scientific observations throughout solving the mystery. Results indicated that learners successful in solving the mystery had greater learning outcomes and a greater time spent on reflection when a disease was detected within food items, but shorter durations on reflections after talking to a nurse. Potential parameters for the instructional design of GBLEs to optimize learning gains through reflections are discussed.

Session S 15

26 August 2021 14:30 - 15:30

Session Room 3

Single Paper

Instructional Design, Learning and Social Interaction

Early Childhood Education

Keywords: Case Studies, Competencies, Comprehension of Text and Graphics, Content Analysis, Early Childhood Education, Instructional Design, Peer Interaction, Primary Education, Technology, Video Analysis

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 05 - Learning and Development in Early Childhood, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Kenneth Pettersen, University of Oslo, Faculty of Education, Norway

Visual images in biology books for young children: Semiotic analysis and pedagogical implications

Keywords: Comprehension of Text and Graphics, Content Analysis, Early Childhood Education, Instructional Design

Presenting Author:Vasilia Christidou, Aristotle University of Thessaloniki, Greece; **Co-Author:**Maria Koutsikou, University of Thessaly, Greece

Images are the most prevalent and crucial mode of communicating biology concepts in books for preschool children. Apart from presenting actions and processes (representational meaning) and their composition in a text (compositional meaning), images realize interpersonal meanings, concerning the way they address the reader (address), the nature of relationship between reader – represented participants (social distance) and the extent to which the reader is engaged with what is represented (involvement). These meanings reveal the role and position of the reader in relation to the represented knowledge and reflect pedagogical principles for young children's learning. This study investigated the kinds of interpersonal meanings constructed visually in biology books for preschool children. The sample consisted of 150 randomly selected images of living entities included in 15 biology books for preschool children. The framework of analysis was based on the Grammar of Visual Design. Results demonstrate that the analyzed images tend to assign a passive role to the children-readers, promote a neutral or detached relationship between children and represented biological entities and fail to promote their involvement with the represented knowledge. These visual interpersonal meanings are not consistent with sociocognitive perspectives on science learning and have pedagogical implications for young children's first learning experiences with biology concepts. The study may support teachers in interpreting, selecting, designing and evaluating multimodal science teaching material that heavily rely on the visual mode, but also in using them to promote visual communication competencies and children's science learning.

Understanding Grade One Student's Transitional Competencies Throughout a Picture Book Intervention

Keywords: Case Studies, Competencies, Early Childhood Education, Primary Education

Presenting Author:Wan Yi Eva Liu, The University of Hong Kong, Hong Kong; **Co-Author:**Wai Ming Cheung, The University of Hong Kong, Hong Kong

Transitioning from pre-school to primary school is a challenging period for children. This study aims at understanding the transitional competences (TCs) of Grade One students through a picture book intervention during the first school year of COVID-19 pandemic. Four students (N=4, F=2, M=2, Mean age=5.75) participated in this multiple case studies. Qualitative data were collected and analysed. Students were interviewed before and after the picture book intervention. Lessons during the picture book intervention were observed, recorded, and transcribed for analysis. Students' writings were also analysed. The findings showed perspectives of TCs from the students. Through the use of a picture book, students were able to articulate how they feel about being a Grade One student, whether they are positive or negative. In the COVID-19-era, this study has also illustrated the importance of non-academic aspects of school life in the eyes of students.

Post-Digital Block Play in a Nordic Pre-School

Keywords: Early Childhood Education, Peer Interaction, Technology, Video Analysis

Presenting Author:Kenneth Pettersen, University of Oslo, Faculty of Education, Norway; **Co-Author:**Hans Christian Arnseth, University of Oslo, Norway; **Co-Author:**Kenneth Silseth, University of Oslo, Norway

The study, situated in the field of digital childhoods, departs from a larger ethnographic fieldwork and does a micro-ethnographic analysis of a play sequence in which three young children engage in Minecraft-inspired block play in pre-school. To aid our analysis, two terms are discussed in relation to our data. Connected play refers to how play takes place in a post-digital age, where notions like digital and non-digital are blurred. Ecotones refer to the transition spaces between parts of larger learning ecosystems. The analysis shows that Minecraft as a phenomenon cannot be understood in isolation as a digital game, but is enacted materially and discursively across settings, in our case in connected play practices with blocks in a pre-school common room, illustrating how ecotones dynamically emerge inside educational institutions.

Session S 16

26 August 2021 14:30 - 15:30

Session Room 2

Single Paper

Higher Education, Learning and Instructional Technology

Workplace Learning

Keywords: Competencies, Ethnography, Higher Education, Interdisciplinary, Learning Technologies, Professions and Applied Sciences, Workplace Learning

Interest group: SIG 14 - Learning and Professional Development

Chairperson: Alberto Nagle Cajes, Uruguay

Stress of experts and novices in the flight simulator: Is it order of scenarios that matter?

Keywords: Competencies, Learning Technologies, Professions and Applied Sciences, Workplace Learning

Presenting Author:Joni Lämsä, University of Jyväskylä, Finland; **Co-Author:**Raija Hämäläinen, University of Jyväskylä, Finland; **Co-Author:**Katriina Eerikäinen, University of Jyväskylä, Finland; **Co-Author:**Ville Heilala, University of Jyväskylä, Finland; **Co-Author:**Arto Helovuo, Finnair Flight Academy, Finland; **Co-Author:**Jouni Helske, University of Jyväskylä, Finland; **Co-Author:**Tommi Kärkkäinen, University of Jyväskylä, Finland; **Co-Author:**Emilia Lampi, University of Jyväskylä, Finland; **Co-Author:**Ari Tuhkala, University of Jyväskylä, Finland; **Co-Author:**Ilkka Tynkkynen, Finnair Flight Academy, Finland; **Co-**

Author:Matti Vihola, University of Jyväskylä, Finland

In aviation, simulator training plays an essential role for both experts and novices. While the simulator training aims to increase the performance in unusual and challenging circumstances, the pilots' stress may be associated with the changes in how learning processes occur when external circumstances change. Here, we focus on expert ($n = 7$) and novice pilots' ($n = 6$) heart-rate-variability (HRV) in a basic and challenging landing scenario in a high-fidelity flight simulator. We use HRV as a stress measure, studying how the measured stress differs between these two landing scenarios. We also investigate the differences between the measured and self-reported stress between the expert and novice pilots. A question from the after-simulator training survey captured the participants' self-reported stress during the challenging landing. The findings show the pilots were not more stressed during the challenging landing when the basic landing preceded it. Also, the within-group variation among the expert and novices was large regarding the measured and self-reported stress. Our findings may help in understanding the role of stress in simulator training, helping structure simulator training sessions and provide targeted recommendations for action in real-world conditions.

Categorisation as interprofessional design work in health

Keywords:Ethnography, Interdisciplinary, Professions and Applied Sciences, Workplace Learning

Presenting Author:Christopher Sadorge, University of Oslo, Faculty of Education, Norway; **Co-Author:**Monika Nerland, University of Oslo, Norway; **Co-Author:**Asa Makitalo, University of Gothenburg, Sweden

While extensive research has focused on the implications of digitalization for professional work and learning with technologies (Harteis 2018; Hertzum & Simonsen, 2019), less attention has been given to collaborative processes in which different groups of professionals design technologies and ways of working concurrently. This paper examines such processes in the health sector, focusing on how a team of IT developers and health professionals design a digital categorization system for the registration and sharing of patient information across units of health care. Applying a socio-material perspective on collaborative work as communicative practice, we analyze how professional categories and knowledge of work contexts are mobilized and negotiated in the design process. Data consists of recorded meeting observations, interviews and project documents collected over a period of one year. Findings show how interprofessional design work depends on a range of epistemic practices that is, practices through which knowledge is mobilized, generated and justified (Kelly & Licona, 2018). Through these practices, visions of how the information system will be used in the services are negotiated and generated. The paper argues that an understanding of these processes and the communicative challenges they pose are increasingly important, as professionals become co-designers of digital systems for specific use and learning at work relates as much to these processes as to their capacities to take ready-made technologies into use.

Impact of clinical leadership professional development on individuals and organisations

Keywords:Higher Education, Interdisciplinary, Professions and Applied Sciences, Workplace Learning

Presenting Author:Riikka Hofmann, University of Cambridge, United Kingdom; **Co-Author:**Jan Vermunt, Eindhoven University of Technology, Netherlands

Evidence suggests that clinical leadership by frontline professionals can improve patient outcomes. Numerous clinical leadership development programmes have emerged, however, there is a paucity of rigorous evaluations of such programmes. Existing evaluations often focus on individual outcomes, with limited attention to organisational impact. Drawing on educational theories of professional learning, this study evaluates the individual and organisational impact of a 10-month Leadership and Management programme targeted at senior specialty trainees and general practitioners in clinical roles. It also examines the mechanisms of clinical leadership development and its organisational impact, making a contribution to our understanding of clinical leadership and professional change. The evaluation draws on in-depth interviews with the programme past participants, as well as a purposefully developed detailed survey to all past participants. Findings show that the programme successfully impacts on participants' capability, willingness and likelihood to engage in service improvement: the participants' make significant positive contributions to their organisations, through increased and sustained service improvement and capacity building. We conclude that clinical leadership development would benefit from drawing on professional learning theory and research. This study shows that this would enable stronger benefits for both individual learning and organisational impacts through developing clinicians' sense of agency, capability to affect change and collaborate effectively across professional boundaries. Furthermore, this study shows that research and educational provision on CL development should attend to risk-taking in leadership development. Implications for further programme development are discussed.

Session S 17

26 August 2021 14:30 - 15:30

Session Room 15

Invited Symposium

Meet the EARLI Editors

Keywords:Qualitative Methods, Quantitative Methods, Student Learning, Teaching/Instruction

Interest group:

Chairperson:Piet Van den Bossche, University of Antwerp, Belgium

Discussant:Piet Van den Bossche, University of Antwerp, Belgium

EARLI publishes three peer-reviewed journals: Learning and Instruction, Educational Research Review and the newest open access journal Frontline Learning Research. Additionally, the EARLI book series, New Perspectives on Learning and Instruction is designed to communicate the high-quality research on learning and instruction to a broader audience of researchers and post-graduate students in education and psychology. Earli members are fully encouraged to submit their current research on the association's journals. The meet the editors symposium aims to inform the EARLI members about the specific aims of each journal, how to select the right journal to publish your research and they will let you in on some of the secrets for a successful submission to the journals. This is an audience-initiated session and participants are invited to raise any question or issue they feel pertinent.

Learning and Instruction

Presenting Author:Lars-Erik Malmberg, University of Oxford, United Kingdom

An international, multi-disciplinary, peer-refereed journal, Learning and Instruction provides a platform for the publication of the most advanced scientific research in the areas of learning, development, instruction and teaching. The journal welcomes original empirical investigations. The papers may represent a variety of theoretical perspectives and different methodological approaches. They may refer to any age level, from infants to adults and to a diversity of learning and instructional settings, from laboratory experiments to field studies. The major criteria in the review and the selection process concern the significance of the contribution to the area of learning and instruction.

Educational Research Review

Presenting Author:Hans Gruber, University of Regensburg, Germany

Educational Research Review is an international peer-reviewed journal aimed at researchers and various agencies interested to review studies in education and instruction at any level. The journal welcomes different types of systematic review-studies, theoretical contributions and shorter forum - papers but does not publish original empirical investigations.

Frontline Learning Research

Presenting Author:Thomas Martens, Medical School Hamburg, Germany

EARLI decided to found a new journal in order to open more publishing opportunities for high level manuscripts. The particular aim was to explore open access publishing and emphasize innovative and risk-taking research in the field of learning and instruction. Frontline Learning Research (FLR) is an open-access electronic-only journal that publishes articles on issues and trends occurring internationally in research on learning and educational sciences. FLR is a forum for multidisciplinary research on learning and learning environments and it aims at enhancing new theoretical and methodological approaches in learning sciences. FLR also welcomes commentaries aimed at triggering discussion about important theoretical and methodological questions about the published articles. During

this session we will discuss the guidelines more deeply and help participants to recognize what features make manuscripts innovative and risk-taking.

New Perspectives on Learning and Instruction

Presenting Author:Isabel Raemdonck, Université Catholique de Louvain, Belgium

New Perspectives on Learning and Instruction is the international, multidisciplinary book series of EARLI and is published by Routledge. The aim of the series is to present to the scholarly community high quality, theoretically-driven research on a specific theme in the domain of learning and instruction. Books that are published in the series are innovative, attempting to forge new conceptions of the field. Originality, scientific merit, and significance for the field are what guide the series. Both edited collections and sole-authored texts that meet these criteria are considered for publication. The focus of the Book Series is on European work, however, contributions from non-European researchers and non-members of the European Association for Research in Learning and Instruction are invited. The series is designed to appeal to a wide audience of researchers and post-graduate students in education and psychology. Latest Book: Dialogues between Northern and Eastern Europe on the Development of Inclusion: Theoretical and Practical Perspectives
Edited by Natallia Bahdanovich Hanssen, Sven-Erik Hansén, Kristina Ström (2021).

Session S 18

26 August 2021 14:30 - 15:30

Session Room 11

Symposium

Motivational, Social and Affective Processes

Teacher motivation, teaching and student motivation: Empirical perspectives

Keywords: Motivation, Quantitative Methods, School Effectiveness, Student Learning, Teacher Effectiveness, Teaching/Instruction

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Rebecca Lazarides, University of Potsdam, Germany

Discussant: Helen Watt, The University of Sydney, Australia

Teacher motivation is a central aspect of teachers' professional competence and has been shown to be of great importance for effective teaching. In the last decade, research has started to systematically investigate facets of teachers' motivation and their relations to teaching behaviors from different theoretical perspectives. Although research has provided evidence for the importance of teaching motivation for teaching behaviors in a great variety of cross-sectional studies, open research questions pertain, for example regarding the question of interrelations between different facets of teacher motivation and different characteristics of teaching. Addressing current developments in the field of international research on teacher motivation, this symposium brings together empirical research from four countries (Netherlands, Germany, Australia, Switzerland) and aims to investigate how different facets of teacher motivation and teaching behaviors are interrelated. The presented studies use complex research methods (e.g., mixture modelling, longitudinal designs, multilevel models) and designs (e.g., video ratings; teacher and student surveys). The studies presented are well-grounded in established theories (e.g., achievement goal theory, intrinsic orientations, job-demands resource model). Thereby, all studies coherently focus on interrelations between teacher motivation and teaching quality. Results suggest that links between teacher motivation and teaching quality are less clear than expected (studies 1 and 2), and that the source of information (study 3) and school environment (study 4) need to be considered when examining relations between teacher motivation and teaching behavior. Our discussant is a well-established expert in the field of teacher motivation and will outline theoretical implications, and perspectives for future research.

Beginning teachers' intrinsic orientation for the profession and its relation to teaching quality

Presenting Author:Xiangyuan Feng, University of Groningen, Netherlands; **Co-Author:**Michelle Helms-Lorenz, University of Groningen, Netherlands; **Co-Author:**Ridwan Maulana, GION - University of Groningen, Netherlands; **Co-Author:**Ellen Jansen, University of Groningen, Netherlands

The knowledge about teachers' intrinsic orientation for the profession (TIOP) is relatively underrepresented in the literature. Particularly, little is known regarding TIOP at the start of professional teaching trajectories. The present study sought to develop a reliable and valid TIOP scale based on hypothesized factorial structure and relationships with other relevant teaching and learning factors. Self-reports on TIOP, observed teaching behaviors, and register data were gathered at four waves from 285 Dutch beginning teachers and their students in Northern Netherlands. Results of the first study suggest that three existing subscales of autonomous motivation, enthusiasm for teaching and enthusiasm for the subject form a higher-order scale of TIOP, which can validly measure the hypothesized value-related cognitive and the feeling-related affective dimensions of TIOP. TIOP seemed to be a consistent teacher characteristic over the first career year. TIOP can significantly predict teachers' self-efficacy, but the direct relationship between TIOP and teaching quality was not evident.

Identifying teachers' motivational profiles and their consequences for teaching quality

Presenting Author:Désirée Thommen, University of Zurich, Institute of Education, Switzerland; **Co-Author:**Urs W. Grob, University of Zurich, Switzerland; **Co-Author:**Anna-Katharina Praetorius, Institut für Erziehungswissenschaft, Switzerland; **Co-Author:**Vanda Sieber, Institute of Education, University of Zurich, Switzerland

Although the influence of teacher motivation on teaching quality is often taken for granted, longitudinal effects have rarely been investigated. Moreover, motivational characteristics investigated so far were usually examined separately. Thus, little attention has been devoted to the combination of motivational characteristics as well as their consequences. Adopting a person-centered approach, the present study analyzed how different motivational characteristics (i.e., self-efficacy, enthusiasm, and goal orientations) combine into profiles and whether these profiles have an effect on teaching quality. Based on a sample of 156 5th grade mathematics teachers, a latent profile analysis was conducted. Three distinct motivational profiles were identified, which differed only in their performance goals: low performance goal oriented (49%), high performance goal oriented (38%), and high performance-avoidance goal oriented (13%). Multilevel path analysis showed that student perceived teaching quality ($N=3,910$) was not significantly predicted by motivational profile membership, after controlling for the baseline (T1) teaching quality. The findings reveal that the link between teacher motivation and teaching quality is less clear than expected. The results are discussed regarding possible underlying reasons and a critical reflection of the explanatory value of the person-centered approach compared to the often used variable-centered approach.

The relative strength of relations between teacher motivation and teaching quality dimensions

Presenting Author:Rebecca Lazarides, University of Potsdam, Germany; **Co-Author:**Ulrich Schiefele, University of Potsdam, Germany

Teacher self-efficacy and teacher interest are two key facets of teacher motivation which are important for high-quality teaching in class. Little is known, however, on the relative strength of the effects of teacher self-efficacy and interest on teaching quality. Thus, we extend research on teacher motivation by examining the relations between teacher self-efficacy and interest and several relevant dimensions of teaching quality as perceived by teachers and students. Participants were 85 secondary teachers (61.2% female) and their students ($n = 1782$; 48.5% female). Based on doubly latent multilevel models, we found that teacher-reported self-efficacy for instruction was positively related to teacher-reported cognitive activation, individualized support, and emotional support. In contrast, teacher-reported educational interest positively related to student-perceived individualized support and to teacher reports of emotional support. At the individual level, results revealed that student-reported teachers' self-efficacy and interest were positively associated with student reports of all dimensions of teaching quality.

Teachers' occupational commitment, school resources and teaching quality

Presenting Author:Rebecca Collie, University of New South Wales, Australia

Teachers' occupational commitment is important given that concerns about high levels of teacher attrition are common across educational systems worldwide. The aim of the current study was to extend knowledge of teachers' occupational commitment by examining predictors at the teacher- and school-level. Several job resources hypothesised to be positively associated with occupational commitment were examined: helpful feedback, input in decision-making, teacher collaboration, and principal discipline support. The moderating role of disruptive student behaviour (which was hypothesised to negatively predict the outcome)

was also examined to see whether the job resources help support teachers' occupational commitment even when disruptive behaviours are high. With 12,955 teachers from 827 schools in four English-speaking countries (Australia, Canada, England, and the US), findings revealed that helpful feedback and input in decision-making were positively associated with occupational commitment at the teacher-level, whereas the reverse was true for disruptive student behaviour. An interaction effect also showed that helpful feedback was particularly important for occupational commitment when disruptive student behaviour was high. At the school-level, input in decision-making and principal discipline support were positively associated with occupational commitment. Findings were similar across the four countries. Implications for practice and research are discussed.

Session T 1

26 August 2021 15:45 - 16:45

Session Room 11

Espresso Invited Symposium

SIG 27: The pitfalls and promises of online collection of process data

Keywords: Computer-assisted Learning, E-Learning/Online Learning, Emotion and Affect, Learning Analytics, Learning Technologies, Mixed-method Research, Motivation and Emotion, Multimedia Learning, Quantitative Methods, Student Learning, Teaching/Instruction, Video Analysis

Interest group: SIG 27 - Online Measures of Learning Processes

Chairperson: Leen Catrysse, Open Universiteit Nederland, Netherlands

Organiser: Leen Catrysse, Open Universiteit Nederland, Netherlands

Organiser: Ellen Kok, Utrecht University, Netherlands

Discussant: Thomas Martens, Medical School Hamburg, Germany

In the COVID-era, many traditional forms of process data-collection are currently difficult or outright impossible. The main reason is that given the pandemic, it is not allowed to go to the lab since universities are closed or to have face-to-face contact. Researchers thus need to be creative and rethink and redesign their studies in order to still collect process data but in a distance-based way. The aim of this symposium is to share experiences with setting up and redesigning studies that make use of distance-based process measures. The first paper will showcase how a lab study was redesigned to a distance-based study in which log data and cued retrospective think aloud data were collected. The second paper will discuss distance-based measures of emotional responses. The last paper will discuss the opportunities of webcam-based eye-tracking. The contributions focus on the impact of remote data collection on for instance data quality, issues with ethics and data protection, or a more natural setting of doing research in. The symposium will give an overview on the several pitfalls and promises of online collection of process data and may provide interesting approaches for research after the pandemic as well.

Processing strategies in learning from video: From the lab to a COVID-proof distance-based study

Presenting Author: Marijn Gijssen, University of Antwerp, Belgium; **Co-Author:** Leen Catrysse, Open Universiteit Nederland, Netherlands; **Co-Author:** Sven De Maeyer, Antwerp University, Belgium; **Co-Author:** David Gijbels, University of Antwerp, Belgium

This presentation reports on the transformation of a lab study to investigate learning from online interactive instructional videos to a covid-proof distance-based study. Originally, the study was planned to be a lab study, making use of psycho-physiological measures for learning, building on earlier research on learning from text. Planned psycho-physiological measures included eye-tracking, gaze replays, and trace data. However, due to the impact of COVID-19, these plans could not come into fulfilment. The design was then adapted to a COVID-proof online version. The presentation will start by briefly exploring the original design followed by an explanation of the changes that were made to transform it into a COVID-proof design. Second, the challenges of this type of design are presented and discussed. To close the presentation, some discussion points will be provided to the attendees to discuss whether this type of design could be fruitful even in non-COVID times and whether we should be prepared for research in more restricted times as for example pandemics.

Measuring electrodermal activity (EDA) with smart rings before and during COVID-19

Presenting Author: Liisa Postareff, HAMK University of Applied Sciences, Finland; **Co-Author:** Petri Nokelainen, Tampere University, Finland; **Co-Author:** Anna Parpala, University of Helsinki, Finland; **Co-Author:** Heta Rintala, Häme University of Applied Sciences, Finland

The ways of conducting research have been affected by the COVID-19 pandemic. Specifically, data collection processes have been challenged by the lack of face-to-face contacts. Our studies utilising psychophysiological measurement with an ambulatory biosensor (Moodmetric Smart Ring, Vigofere Ltd.) measuring electrodermal activity (EDA) have been challenged as personal or group-level contacts with the participants have not been possible. We reflect on our experiences of collecting data in three different studies, one taking place before the COVID-19 and two during the pandemic. The aim of the studies was to investigate the emotions of HE teachers and employees of two companies related to their work. The challenges of collecting psychophysiological data remotely include, for example, providing instruction of the correct use of the ring and avoiding technical problems when starting the use of the rings. Also, ensuring the fit of the ring is challenging in a remote situation. Furthermore, ethical and data protection issues need to be reconsidered when data collection takes place remotely. Moreover, the results of EDA measurements may be affected because people are working from home instead of having face-to-face interaction. In the conference, we will present and compare our experiences of collecting online data before and during the pandemic. Promises and challenges of collecting online data remotely will be discussed.

Webcam-based eye-tracking in educational sciences: Possibilities and some experiences

Presenting Author: Ellen Kok, Utrecht University, Netherlands

Eye-tracking is a technique to measure where a person is looking, for how long, and in which order. It is increasingly used in Educational sciences. Two main practical disadvantages, however, are that you need to supervise the eye-tracking session, which requires close or physical contact (which makes it problematic in the current COVID-era), and that it is relatively time-consuming to collect data. Webcam-based eye-tracking uses webcams in participants' own computers, which makes distance-based (unsupervised) data-collection possible. In this presentation, I will outline some options for webcam-based eye-tracking, how they work, and how we can investigate their data quality. Furthermore, I will discuss experiences with the beta-version of webcam-based eye-tracking in Gorilla.sc.

Session T 2

26 August 2021 15:45 - 16:45

Session Room 8

Espresso Invited Symposium

Culture, Morality, Religion and Education, Learning and Instructional Technology, Learning and Social Interaction

SIG 25: Re-theorizing learning and research methods in learning research

Keywords: Design-based Research, Environmental Education, Ethnography, Higher Education, Out-of-School Learning, Philosophy, Qualitative Methods, Quantitative Methods, Social Aspects of Learning and Teaching, Social Interaction, Technology, Video Analysis

Interest group: SIG 17 - Methods in Learning Research, SIG 25 - Educational Theory

Chairperson: Crina Damsa, University of Oslo, Norway

Organiser: Antti Rajala, University of Oulu, Finland

Organiser: Giuseppe Ritella, University of Helsinki, Finland

Discussant: Peter David Renshaw, The University of Queensland, Australia

Learning and instruction are being profoundly influenced by recent societal and technological developments. Such developments ensue changes also in the way learning and instruction are examined, and how this research contributes to furthering understanding of learning and related phenomena. Instrumental for such new understandings are emerging theoretical perspectives on learning and novel methodologies, often aided by advanced technologies that assist sophisticated

empirical endeavors, Yet, advancement and renewal may be hampered by a limited connection between (new) conceptualizations of learning, and methodological developments, or limited efforts of theorizing of new methods and the way they may contribute to theory development. In this symposium, we aim to initiate a discussion of current developments in the learning theoretical field and innovative methodologies accompanying such conceptual renewal. Through the four contributions - including authors from Finland, Netherlands, Austria, Norway, and Brazil - we attempt to a) explore and illustrate the dialectical relationship between theoretical frameworks that are central in contemporary learning research and novel methodological approaches, b) theorize novel methods and elaborate on how methodological and empirical work provides input for theoretical development, and c) illustrate and reflect on how societal challenges may set off innovation in learning research and how new conceptualizations and methodological advancement stem from such frontline research. The contributions will offer a basis for discussion and reflective dialogue across paradigms of research and on the relationship between the way we engage with researching and how we understand the nature of learning.

Utopian methodology: Addressing the social and ecological crises in research on learning

Presenting Author:Antti Rajala, University of Oulu, Finland; **Presenting Author:**Alfredo Jornet, University of Oslo, Department of Teacher Education and School Research, Spain; **Co-Author:**Inny Accioly, Universidade Federal Fluminense, Brazil

Interconnected socioeconomical and ecological crises challenge us to re-theorize learning. Today's educational research and practice have been dominated by a focus on improving learning outcomes, often based on discourses about 21st century skills that assume a global socioeconomic context that the current crises are proving obsolete. Proposals for alternatives that assume fluid, alternative contexts in which struggle for change is crucial are today scarce. This presentation argues for a transformative onto-epistemological stance, which involves a move from a focus on what is to a focus on what is possible. We discuss utopian methodology as a tool for researching, building and sustaining alternative institutional arrangements. To ground our discussion we examine three ethnographic studies, in Finland, Brazil and Norway, research-practice partnerships involving climate activism, and socio-environmental conflicts through education.

Relating with the more-than-human world: Extending sociocultural theorizing with posthumanism

Presenting Author:Kristiina Kumpulainen, University of Helsinki, Finland

This paper brings sociocultural theorizing in dialogue with posthuman thought in connection to theorizing and researching how children *learn to become* in relation with the more-than-human world. The paper argues that such theorizing is needed in order to better explain and respond to current socio-ecological challenges, including how to educate children to relate to the more-than-human world. To illuminate the approach, the paper builds on an empirical study of how young children in a Finnish elementary school related and learned to become in relation with nature through a novel mobile digital storytelling methodology. The concepts of malleability, continuity, tension, possibility and diverseness are developed as a possible explanatory framework to research and understand how mobile digital storytelling methodology engaged children in dialoguing with the more-than-human world entangling children into imaginative, empathetic, sensuous and ethical relation with nature. Here, the 'other' that extended from humans to more-than-humans was noticed, listened to, cared for and appreciated. The paper ends by considering implications for theory, methodology and educational practice.

Learning in and across digital/physical spaces and time: Methodological and theoretical explorations

Presenting Author:Giuseppe Ritella, University of Helsinki, Finland

This paper is aimed at discussing the interdependency between methodological innovations and novel theoretical conceptualizations in contemporary research on learning and instruction. In particular I will examine the case of the investigation of the role that complex arrays of space-time frames bear for learning and education. The examination of space-time relations is particularly relevant for discussing the interdependency between methods and theory because learning is more and more taking place across digital and physical environments, requiring the set up of complex methodological frameworks, which in turn also have implications for theoretical development. A growing number of studies is demonstrating that space-time relations are difficult to investigate because they often work as an invisible background of educational activities that is most of the time taken as granted by the participants of educational activities and by the researchers examining educational practices.

CANCELLED

Presenting Author:Jasperina Brouwer, University of Groningen, Netherlands; **Co-Author:**Dominik E. Froehlich, University of Vienna, Austria

Students engage in a variety of learning relationships, such as seeking help, establishing collaborations, sharing information, but also the formation of friendship relationships. All these relationships capture different resources, which are necessary for obtaining individual goals. For example, students can get social and academic support from their peers to enhance their well-being and achieve good grades. This means that students build social capital within their peer networks. Through longitudinal social network analysis, we can study how one's social capital and, subsequently, knowledge is being developed. Longitudinal social network analysis, more specifically stochastic actor-oriented modeling (SAOM), can provide a more nuanced understanding of learning processes where students are expected to learn from their peers. Furthermore, these models can provide more insight in different theoretical mechanisms underlying social capital building of students in their peer networks. SAOM captures not only how these peer networks change over time, but also how they contribute to behavior, such as learning and academic performance. This approach is open to include both non-network co-variates and network-related features, such as one's position in the network. Engaging with such methodologies allows us to consider new conceptual understanding of learning viewed as a social phenomenon.

Session T 3

26 August 2021 15:45 - 16:45

Session Room 18

Panel Discussion

Supporting creative minds – Funding opportunities at the European Research Council

Keywords: Interdisciplinary, Researcher Education, Science Education, Social Sciences

Interest group:

Chairperson: Anne Nielsen, Belgium

ERC funds the very best researchers from around the world to investigate topics of their own choosing at the frontier of knowledge. Projects supported by ERC should have the potential to substantially transform their scientific area. Scientists with a PhD older than 2 years and willing to work for part of their time at a host institution in the EU or countries associated to the Framework Programme Horizon Europe can apply. There are no restrictions on research topic, researcher nationality, current affiliation or age as ERC would like to attract the best researchers to come to Europe for projects of up to 6 years with a funding level between 1.5 and 10 million EUR (depending on the call).

In the first part of this session, we will explain how the ERC application and evaluation process works. In addition, two scientists working in Education Studies and related research fields who have successfully applied to ERC will share their experiences on how to prepare a successful ERC application. Tips and tricks on how to run an ERC grant will be provided and participants will have the possibility to ask questions.

Supporting creative minds – Funding opportunities at the European Research Council

Presenting Author:KATRIEN VAN POECK, Ghent University & Uppsala University, Belgium; **Presenting Author:**Pedro Carneiro, University College London, United Kingdom

ERC funds the very best researchers from around the world to investigate topics of their own choosing at the frontier of knowledge. Projects supported by ERC should have the potential to substantially transform their scientific area. Scientists with a PhD older than 2 years and willing to work for part of their time at a host institution in the EU or countries associated to the Framework Programme Horizon Europe can apply. There are no restrictions on research topic, researcher nationality, current affiliation or age as ERC would like to attract the best researchers to come to Europe for projects of up to 6 years with a funding level between 1.5 and 10 million EUR (depending on the call).

In the first part of this session, we will explain how the ERC application and evaluation process works. In addition, two scientists working in Education Studies and related research fields who have successfully applied to ERC will share their experiences on how to prepare a successful ERC application. Tips and tricks on how to run an ERC grant will be provided and participants will have the possibility to ask questions.

Session T 4

26 August 2021 15:45 - 16:45

Session Room 12

Panel Discussion

Motivational, Social and Affective Processes

Bridging Research and Practice: Self-Regulated Learning and Teaching during the Global Pandemic

Keywords: Developmental Processes, Motivation and Emotion, Self-regulation, Teacher Professional Development

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Adar Ben-Eliyahu, University of Haifa, Faculty of Education, Israel

The COVID-19 pandemic has sent almost 90% of the world's children to social isolation and distance learning. Social distancing measures have fundamentally reshaped how teachers teach and students learn. For instance, while the long-term implications have yet to be seen, educators and students were forced to quickly learn how to use various technologies and find creative solutions for maintaining a certain level of teaching and learning under highly challenging circumstances. Educators and students need to plan, monitor, and adjust their teaching and learning to handle novel and challenging goals and to create environments that are conducive to learning – i.e., they need to engage in core self-regulation processes. Furthermore, teaching and learning under duress and uncertainty augment the role that stress and emotions play in shaping the educational process. Accordingly, the proposed panel discussion includes practicing teachers and experts in the fields of emotions, motivation, and self-regulated learning who will focus on: (a) how teaching and learning have changed in the context of social distancing (e.g., teachers' and students' self-regulation and coping strategies in different national contexts and students' age groups), (b) lessons learned from research on teachers' and students' self-regulation, motivation, and emotions in a time of crisis, and (c) synergies and gaps between research and practice. The panelists (three teachers and four researchers) will conclude with lessons learned for crisis preparedness, what needs to be re-learned, and open questions for the (near) future as we enter a new school year at the tail end of the global pandemic.

Bridging Research and Practice: Self-Regulated Learning and Teaching during the Global Pandemic

Presenting Author: Reinhard Pekrun, Ludwig-Maximilians-Universität, Germany; **Presenting Author:** Allyson Hadwin, University of Victoria, Canada;

Presenting Author: Roger Azevedo, University of Central Florida, United States; **Presenting Author:** Lili Sarfaty, University of Haifa, Faculty of Education, Israel; **Presenting Author:** Insa Linnerud, Benedictus-Realschule Tutzing (teacher in Germany), Germany; **Co-Author:** Fani Lauermann, TU Dortmund University, Germany; **Co-Author:** Moira Hood, University of Victoria, Canada

The COVID-19 pandemic has sent almost 90% of the world's children to social isolation and distance learning. Social distancing measures have fundamentally reshaped how teachers teach and students learn. For instance, while the long-term implications have yet to be seen, educators and students were forced to quickly learn how to use various technologies and find creative solutions for maintaining a certain level of teaching and learning under highly challenging circumstances. Educators and students need to plan, monitor, and adjust their teaching and learning to handle novel and challenging goals and to create environments that are conducive to learning – i.e., they need to engage in core self-regulation processes. Furthermore, teaching and learning under duress and uncertainty augment the role that stress and emotions play in shaping the educational process. Accordingly, the proposed panel discussion includes practicing teachers and experts in the fields of emotions, motivation, and self-regulated learning who will focus on: (a) how teaching and learning have changed in the context of social distancing (e.g., teachers' and students' self-regulation and coping strategies in different national contexts and students' age groups), (b) lessons learned from research on teachers' and students' self-regulation, motivation, and emotions in a time of crisis, and (c) synergies and gaps between research and practice. The panelists (three teachers and four researchers) will conclude with lessons learned for crisis preparedness, what needs to be re-learned, and open questions for the (near) future as we enter a new school year at the tail end of the global pandemic.

Session T 5

26 August 2021 15:45 - 16:45

Session Room 13

Panel Discussion

Higher Education

Transforming Learning: Partnering with Undergraduate Students to Tackle World Challenges

Keywords: Citizenship Education, Higher Education, Inquiry Learning, Interdisciplinary

Interest group: SIG 04 - Higher Education

Chairperson: Tracy Zou, The University of Hong Kong, Hong Kong

In this rapidly changing, interconnected world, many opportunities and challenges students will face in future do not yet exist. This leads to discussions around how we educators prepare students for a future that is largely unknown to us. At the University of Hong Kong, and in collaboration with several other institutions and community partners, we have formed *Critical Zones* (cf. Latour, 2014), an initiative to transform learning and develop citizenship by partnering with undergraduate students, Student Peer Mentors, and Faculty Mentors to address three United Nations' Sustainable Development Goals (SDGs): Good Health and Well-Being (#3), Gender Equality (#5), and Sustainable Cities and Communities (#11). Students are working in teams--guided by Student Peer Mentors, a recently graduated Coordinator, and facilitated by 'light-touch' Faculty Mentors--on a student-initiated research topic associated with one or more of the SDGs. This panel discussion will focus on the design, process, and outcome of the initiative, with emphasis on the partnership among academics, students, and community partners. Some key elements to the success of our initiative included discovering the passion of students, establishing exciting yet feasible goals, navigating between the global challenge and the local community needs, providing structured feedback on key milestones while balancing that with autonomy and creativity, and offering space for the sharing of student work. During the panel discussion, we will share our learning and partnership designs with specific tools on key research steps and will also invite participants to discuss how our design might be applicable or adapted to different cultural settings.

Transforming Learning: Partnering with Undergraduate Students to Tackle World Challenges

Presenting Author: Gray Kochhar-Lindgren, The University of Hong Kong, Hong Kong; **Presenting Author:** Lily Leung, University of Hong Kong, Hong Kong;

Presenting Author: Benita Chick, Encompass HK, Hong Kong; **Presenting Author:** Mei Tin Ming, The University of Hong Kong, Hong Kong

In this rapidly changing, interconnected world, many opportunities and challenges students will face in future do not yet exist. This leads to discussions around how we educators prepare students for a future that is largely unknown to us. At the University of Hong Kong, and in collaboration with several other institutions and community partners, we have formed *Critical Zones* (cf. Latour, 2014), an initiative to transform learning and develop citizenship by partnering with undergraduate students, Student Peer Mentors, and Faculty Mentors to address three United Nations' Sustainable Development Goals (SDGs): Good Health and Well-Being (#3), Gender Equality (#5), and Sustainable Cities and Communities (#11). Students are working in teams--guided by Student Peer Mentors, a recently graduated Coordinator, and facilitated by 'light-touch' Faculty Mentors--on a student-initiated research topic associated with one or more of the SDGs. This panel discussion will focus on the design, process, and outcome of the initiative, with emphasis on the partnership among academics, students, and community partners. Some key elements to the success of our initiative included discovering the passion of students, establishing exciting yet feasible goals, navigating between the global challenge and the local community needs, providing structured feedback on key milestones while balancing that with autonomy and creativity, and offering space for the sharing of student work. During the panel discussion, we will share our learning and partnership designs with specific

tools on key research steps and will also invite participants to discuss how our design might be applicable or adapted to different cultural settings.

Session T 6

26 August 2021 15:45 - 16:45

Session Room 17

Panel Discussion

Higher Education

Doctoral education during the pandemic and beyond: challenges and strategies

Keywords: Doctoral Education, Learning Analytics, Researcher Education, Technology

Interest group: SIG 24 - Researcher Education and Careers

Chairperson: Brian Cahill, Germany

This session will discuss how the COVID-19 pandemic has affected early-career researchers and what lessons can be learned for doctoral education and training with a special focus on doctoral programmes in educational research related areas. Since the introduction of lockdowns throughout Europe during March 2020, many researchers have been forced to modify, restrict or reduce their research activity. Home working may suit some researchers but research work often depends on access to laboratories, research infrastructure, field work and archives. For those with parental responsibilities, the lockdown was accompanied by a closure of schools and childcare that reduced the time available to work from home. International researchers have experienced greater isolation. In particular, we will highlight issues related to the mental wellbeing of PhD candidates and discuss survey data showing how the crisis has exacerbated mental health issues among early-career researchers. This session will present and discuss strategies and practices from and for doctoral programs, including shifting PhD supervision, evaluation and promotions online, provision of online doctoral training, improving digital communication in doctoral supervision, securing doctoral funding extensions and handling restrictions in international mobility.

Doctoral education during the pandemic and beyond: challenges and strategies

Presenting Author:Gábor Kismihók, Leibniz Information Centre for Science and Technology, Germany; **Presenting Author:**Inge Van der weijden, Leiden University, Netherlands; **Presenting Author:**Alexander Hasgall, European University Association, Switzerland; **Presenting Author:**Janet Metcalfe, Vitae, United Kingdom

This session will discuss how the COVID-19 pandemic has affected early-career researchers and what lessons can be learned for doctoral education and training with a special focus on doctoral programmes in educational research related areas. Since the introduction of lockdowns throughout Europe during March 2020, many researchers have been forced to modify, restrict or reduce their research activity. Home working may suit some researchers but research work often depends on access to laboratories, research infrastructure, field work and archives. For those with parental responsibilities, the lockdown was accompanied by a closure of schools and childcare that reduced the time available to work from home. International researchers have experienced greater isolation. In particular, we will highlight issues related to the mental wellbeing of PhD candidates and discuss survey data showing how the crisis has exacerbated mental health issues among early-career researchers. This session will present and discuss strategies and practices from and for doctoral programs, including shifting PhD supervision, evaluation and promotions online, provision of online doctoral training, improving digital communication in doctoral supervision, securing doctoral funding extensions and handling restrictions in international mobility.

Session T 7

26 August 2021 15:45 - 16:45

Session Room 5

Symposium

Learning and Instructional Technology

New Ways of Measuring, Analysing and Scaffolding Self-Regulated Learning

Keywords: Assessment Methods and Tools, Instructional Design, Interdisciplinary, Learning Analytics, Learning Technologies, Metacognition, Self-regulation

Interest group:

Chairperson: Joep van der Graaf, Radboud University Nijmegen, Netherlands

Organiser: Joep van der Graaf, Radboud University Nijmegen, Netherlands

Discussant: Philip Winne, Simon Fraser University, Canada

New ways of measuring and analysing Self-Regulated Learning (SRL) are rapidly emerging. This has important implications for theoretical frameworks of SRL, methodological approaches, and for current educational practices. The first aim of this symposium is to present and discuss new approaches to measurement and analysis of SRL. The second aim is to provide suggestions on the design of educational materials that provide additional insights into students' learning processes and support their SRL. The presenters are a group of international researchers, who have a strong interest in learning analytics and/or SRL. The presentations are incrementally ordered, moving from measurement and analysis of SRL (1, 2) to learning outcomes (3) and ending with a digital learning tool (4). The four presentations revolve around the following main questions: a) How can multimodal data improve the granularity of measurement of SRL? b) How does SRL unfold in high versus low performing students? c) How do SRL activities relate to different learning outcomes? And d) How can we support students by visualising their SRL process? By addressing these questions, this symposium provides suggestions for theory and methodological development as well as educational practice.

Improving the granularity for the measurement of self-regulated learning using multi-channel data

Presenting Author:Yizhou Fan, The University of Edinburgh, United Kingdom; **Co-Author:**Lyn Lim, Technical University of Munich, Germany; **Co-Author:**Joep van der Graaf, Radboud University Nijmegen, Netherlands; **Co-Author:**Jonathan Kilgour, The University of Edinburgh, United Kingdom; **Co-Author:**Johanna Moore, The University of Edinburgh, United Kingdom; **Co-Author:**Dragan Gasevic, Monash University, Australia; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands

In recent years, unobtrusive measures of self-regulated learning (SRL) processes based on log data recorded by digital learning environments have attracted increasing attention. However, researchers have also recognised that simple navigational log data or time spent on pages are often not fine-grained enough to study complex SRL processes. Recent advances in data-capturing technologies enabled researchers to go beyond simple navigational logs to measure SRL processes with multi-channel data. Though, to what extent can the addition of peripheral and eye-tracking data with navigational data improve the granularity of measurement of SRL are key questions that require further investigation. Hence, we conducted a study that aimed to address this problem by enhancing navigational log data with peripheral and eye-tracking data. Based on the measurement protocol proposed in this study, we were able to compare the process models of SRL of n=25 students across different data channels. The results revealed that by adding new data channels, we improved the capture of learning actions and detected SRL processes while enhancing the granularity of the measurement. In addition, we also concluded that eye-tracking data is valuable for measuring and extracting SRL processes, and it should receive more attention in the future.

Understanding Self-Regulated Learning Processes through Process Mining

Presenting Author:Lyn Lim, Technical University of Munich, Germany; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany; **Co-Author:**Joep van der Graaf, Radboud University Nijmegen, Netherlands; **Co-Author:**Yizhou Fan, The University of Edinburgh, United Kingdom; **Co-Author:**Jonathan Kilgour, The University of Edinburgh, United Kingdom; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Johanna Moore, The University of Edinburgh, United Kingdom; **Co-Author:**Dragan Gasevic, Monash University, Australia

Self-regulated learning (SRL) is related to better learning outcomes and observation of SRL using think aloud data has been shown to be more insightful in

determining SRL activities and predicting students' learning achievements than self-reports. Educational process mining, moreover with think aloud data, enables a deeper understanding and a more fine-grained analysis of SRL processes. This study based on a pre-post design aimed to investigate how students differ in SRL learning processes and how this affects learning performance. There were 32 university students who participated in the study to learn about the theme, "Artificial Intelligence in Education", and they had to write an essay in a digital learning environment within a 45-minute learning session while thinking aloud. The results showed that there is a significant learning gain in the knowledge test. Besides, the top performers showed more metacognitive and cognitive activities during learning. Furthermore, process mining using HeuristicMiner algorithm based on post hoc coded think aloud protocols examined differences in process structures of SRL for the high and low performers. In general, comparing resulting process mining models with prior process mining models will help to better generalize findings of prior research.

How Self-Regulated Learning Affects Different Learning Outcomes

Presenting Author:Joep van der Graaf, Radboud University Nijmegen, Netherlands; **Co-Author:**Lyn Lim, Technical University of Munich, Germany; **Co-Author:**Yizhou Fan, The University of Edinburgh, United Kingdom; **Co-Author:**Jonathan Kilgour, The University of Edinburgh, United Kingdom; **Co-Author:**Johanna Moore, The University of Edinburgh, United Kingdom; **Co-Author:**Dragan Gasevic, Monash University, Australia; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands

Self-regulated learning (SRL) fosters transfer, but effects on other learning outcomes, such as domain knowledge are mixed. SRL potentially has a differential impact on learning outcomes with different characteristics, deep vs surface knowledge, and independent vs connected concepts. Therefore, we assessed how surface knowledge measured with a domain test (independent), and a concept map (connected) and deep knowledge measured with a transfer test (independent) and an essay (connected) are associated to SRL activities during learning and to prior metacognitive knowledge. Forty-five university students performed a 45-minute problem-solving task integrating three topics into a vision on future of education. SRL activities were measured using think aloud. Results revealed learning occurred. Surface knowledge measures, independent and connected concepts, were related to each other and associated with low cognitive activities during learning. Deep knowledge of independent concepts was associated with low cognitive processes, while deep knowledge of connected concepts was associated with a mixture of low and high cognitive processes. In addition, we found that prior metacognitive knowledge was associated with deep knowledge of independent concepts. To conclude, taking the level and structure of knowledge into account helps to specify effects of SRL processes on learning outcomes.

Visualising student's learning strategies in online learning to support self-regulation

Presenting Author:Shaveen Singh, Monash University, Australia; **Co-Author:**Mladen Rakovic, Monash University, Australia; **Co-Author:**Yizhou Fan, The University of Edinburgh, United Kingdom; **Co-Author:**Lyn Lim, Technical University of Munich, Germany; **Co-Author:**Joep van der Graaf, Radboud University Nijmegen, Netherlands; **Co-Author:**Jonathan Kilgour, The University of Edinburgh, United Kingdom; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Johanna Moore, The University of Edinburgh, United Kingdom; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany; **Co-Author:**Dragan Gasevic, Monash University, Australia

Visualisations provide an effective way for learners to gain insight into their learning process which, in turn, may promote their self-regulated learning. Yet few learner-facing visualisations have been developed to support learners' self-regulation. To this purpose, we propose a collection of personalised, theory-based and empirically driven visual interfaces. We harnessed trace data from multiple channels to generate clear and actionable recommendations for learners to improve their regulation. Guided by a quasi-experimental study in an university context (n=25), we investigated the student's critical learning processes in SRL, such as, planning, content consumption, working on task, monitoring and evaluation. In the presentation, we describe the learning environment to collect data about those processes, and suggest visualizations that rely upon these data sources. In an ongoing study, we will prompt learners to engage in metacognitive monitoring of their learning using visualisations to support their regulation and learning.

Session T 8

26 August 2021 15:45 - 16:45

Session Room 16

Single Paper

Higher Education, Motivational, Social and Affective Processes

Interdisciplinary Studies

Keywords: Achievement, Artificial Intelligence, Cognitive Skills, Educational Psychology, Emotion and Affect, Experimental Studies, Higher Education, Interdisciplinary

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion

Chairperson: Fleur van Gils, KU LEUVEN, Belgium

Optimizing Students' Mental Health and Academic Success: AI-Enhanced Life Crafting

Keywords: Artificial Intelligence, Educational Psychology, Higher Education, Interdisciplinary

Presenting Author:Izaak Dekker, Erasmus University Rotterdam, Netherlands; **Co-Author:**Bettina De Jong, Erasmus University Rotterdam, Netherlands; **Co-Author:**Michaéla Schippers, Erasmus University Rotterdam, Netherlands; **Co-Author:**Monique De Bruijn, Erasmus University Rotterdam, Netherlands; **Co-Author:**Andreas Alexiou, University of Tilburg, Netherlands; **Co-Author:**Bas Giesbers, Erasmus University Rotterdam, Netherlands

One in three students experiences mental health problems during their study. A similar percentage leaves higher education without obtaining the degree for which they enrolled. Research suggests that both mental health problems and academic underperformance could be caused by students lacking control and purpose while they are adjusting to tertiary education. This narrative review paper proposes to integrate two interventions from different fields that together could boost both well-being and academic success during the adjustment period. AI Mental-healthcare chatbots can offer a scalable and effective solution to mental health problems and provide personalized coaching. Life-crafting interventions in which students prioritize goals, and formulate goal attainment plans, have proven to be a scalable way to improve academic success. Because the life-crafting intervention doesn't bear the stigma that is associated with therapy, it can reach a larger population in a positive manner. When a chatbot delivers the life crafting intervention and provides personalized follow-up coaching, this can prevent both academic and mental health problems. Right on-time delivery and personalized questions enhance the effects of both interventions. Future research on this new combination of interventions should use design principles that increase user-friendliness and monitor the technology acceptance of its participants.

Relevance of Spatial Visualization Ability for Study Achievement in different STEM study programs

Keywords: Achievement, Cognitive Skills, Higher Education, Interdisciplinary

Presenting Author:Nils Nolte, University of Duisburg-Essen, Germany; **Co-Author:**Fleischer Fleischer, Ruhr-University Bochum, Germany; **Co-Author:**Christian Spoden, German Institute for Adult Education - Leibniz Centre for Lifelong Learning, Germany; **Co-Author:**Detlev Leutner, University of Duisburg-Essen, Germany

Numerous studies showed a connection between spatial abilities and academic achievement in different STEM disciplines. We extend previous research by directly comparing this connection across different disciplines and including indirect effects. We tested 1,394 German university freshmen in civil engineering, chemistry, biology, and social science as a non-STEM reference discipline with tests of spatial visualization and subject-specific content knowledge. Results showed a strong indirect effect of spatial visualization on acquired content knowledge at the end of the first semester via both prior content knowledge and high-school GPA for civil engineering ($\beta = .50$) and chemistry ($\beta = .49$), while the effect was weaker for social science ($\beta = .20$). For biology, the effect was in between ($\beta = .34$). These results solidify the relevance of spatial visualization for the acquisition of STEM content knowledge at university and indicate that it already affects earlier educational outcomes at high school. Thereby, the results provide arguments for fostering spatial abilities at different educational levels to facilitate later STEM studies.

Psychological stress = physiological stress? An experimental study with prospective teachers

Keywords: Educational Psychology, Emotion and Affect, Experimental Studies, Interdisciplinary

Presenting Author:Sara Becker, Pädagogische Hochschule Freiburg, Germany; **Co-Author:**Birgit Spinath, Heidelberg University, Germany; **Co-Author:**Beate Ditz, Heidelberg University, Germany; **Co-Author:**Tobias Dörfler, Heidelberg University of Education, Germany

AbstractTeachers manage complex social situations within the classroom, which can trigger internal conditions like stress. Research on teacher stress is mostly based on the experiences of psychological stress collected through questionnaires, thus reflecting self-reported data (Krause et al., 2013). However, a large number of physiological processes are not experienced consciously (Pennebaker, 2011). But, it is physiological stress response in particular, such as an increased release of the stress hormone cortisol, which can impair cognitive functions. Up to now, there is no empirical evidence of the correlation between the experiences of psychological stress and the physiological stress responses in teachers.

Due to this current research situation, the aim of this study was to analyze the association between the experience of psychological stress and the physiological stress response in teachers. In an experiment a control group was compared with a stress group. The stress within the stress group was induced with the help of an acute laboratory stressor. In both groups, the experience of psychological stress was measured with questionnaires, the physiological stress response was measured by collecting saliva samples, which were analyzed regarding cortisol concentrations. Results showed no significant difference between the experiences of psychological stress of the two groups, but the stress group had significantly increased cortisol concentrations compared to the control group. Furthermore, there was no significant correlation between the psychological and the physiological stress parameters.

Session T 9

26 August 2021 15:45 - 16:45

Session Room 9

Single Paper

Educational Policy and Systems, Higher Education, Learning and Instructional Technology

Reading Comprehension and Secondary Data Analysis

Keywords: Interdisciplinary, Mathematics, Motivation and Emotion, Numeracy, Quantitative Methods, Reading Comprehension, Secondary Data Analysis, Teaching/Instruction, Technology

Interest group: SIG 02 - Comprehension of Text and Graphics

Chairperson: Janneke Sleenhof, Eindhoven School of Education, Netherlands

What Makes Mathematics Difficult for Adults? The Role of Reading Components in Solving Math Items

Keywords: Mathematics, Numeracy, Reading Comprehension, Secondary Data Analysis

Presenting Author:Nadine Cruz Neri, University of Hamburg, Germany; **Co-Author:**Jenny Wagner, University of Hamburg, Germany; **Co-Author:**Jan Retelsdorf, University of Hamburg, Germany

Although it is widely known that reading comprehension plays a significant role in mathematics performance, it remains unclear how specific reading components skills and item characteristics are associated with adults' mathematics performance. The aim of this study was to investigate (1) reading components skills (printed vocabulary, sentence processing, passage comprehension), (2) characteristics of mathematics items (picture/table, tense, number of prepositions, lexical density), and (3) possible interaction effects thereof on adults' mathematics performance. The sample consisted of 368 German adults (age: $M = 50.45$; 59% female). Our results showed main effects of adults' reading components skills and item characteristics on performance. Furthermore, most existing interaction effects of sentence processing and passage comprehension with item characteristics on mathematics performance did not hold when controlling for gender and migratory background. Implications to support adults with low reading skills may include enhancing their reading component skills and adapting mathematics items by reducing linguistic complexity.

Practices with digital reading devices in the language arts classroom: evidence from NAEP 2017

Keywords: Reading Comprehension, Secondary Data Analysis, Teaching/Instruction, Technology

Presenting Author:Ladislao Salmeron, University of Valencia, Spain; **Co-Author:**Cristina Vargas, University of Valencia, Spain; **Co-Author:**Pablo Delgado, University of Valencia, Spain; **Co-Author:**Naomi Baron, American University, United States

Concerns about the negative effects of digitalization in students' reading comprehension, empirically backed by recent meta-analyses, question the efficacy of digital tools in the language arts classroom. By analyzing data from 4th and 8th grade US students from NAEP 2017, we aimed to test the generalization of the screens effects on comprehension within language arts classrooms, and to identify the most effective teachers' practices to support comprehension with digital tools. Results revealed that even small daily amounts of use of digital devices (here, 30 minutes) were negatively related to comprehension. In addition, teachers' practices using digital tools had different impacts on student outcomes. We discuss those results in light of our current understanding of the effects of digitalization in reading.

Gender effects of motivational and emotional orientations on math, science, and reading achievement

Keywords: Interdisciplinary, Motivation and Emotion, Quantitative Methods, Secondary Data Analysis

Presenting Author:Frank Reinhold, University of Education Freiburg, Germany; **Co-Author:**Jennifer Diedrich, Technical University of Munich, Germany; **Co-Author:**Sarah Hofer, University of the Federal Armed Forces in Munich, Germany; **Co-Author:**Anja Schiepe-Tiska, Technical University of Munich, Germany

Gender differences in STEM fields are among the most prominent empirical findings in educational contexts. Motivational and emotional orientations are successful in partly explaining those gender gaps. A still open question is whether those gender gaps are persistent when focusing on the same motivational and emotional orientations in different domains and across different countries. We used data from the latest PISA cycles and compared standardized regression coefficients between boys and girls, predicting mathematics, science, and reading achievement by interest and self-efficacy. For reading, a clear pattern in the effect of interest and self-efficacy on achievement in favor for girls occurred, which holds for rather all countries taking part in the PISA assessment. However, when focusing on mathematics and science achievement, the effects were more diverse. In mathematics, the global effect was comparable to reading. However, in science the pattern flipped for interest but lacked a general directional structure for self-efficacy.

Session T 10

26 August 2021 15:45 - 16:45

Session Room 7

Single Paper

Instructional Design

Design-based Research

Keywords: Computer-supported Collaborative Learning, Conceptual Change, Design-based Research, Higher Education, Instructional Design, Language (L1/Standard Language), Metacognition, Writing/Literacy

Interest group: SIG 03 - Conceptual Change, SIG 12 - Writing, SIG 24 - Researcher Education and Careers

Chairperson: Inga Wagner, University of Koblenz-Landau, Germany

Design principles for argumentative writing focusing on strategic and conversational support

Keywords: Design-based Research, Instructional Design, Language (L1/Standard Language), Writing/Literacy

Presenting Author:Yana Landrieu, Ghent University, Belgium; **Co-Author:**Fien De Smedt, Ghent University, Belgium; **Co-Author:**Bram De Wever, Ghent

University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium

Previous research consistently indicated the effectiveness of strategic and conversational support on students' argumentative writing. However, most of the research articles investigating these evidence-based writing practices fail to include clear and detailed descriptions of the interventions. Consequently, researchers and educational practitioners have no perception of the crucial ingredients underlying these interventions, hindering replication, dissemination, and implementation of evidence-based writing practices. In the present study, we provide in-depth insight into the content and structure of a class-wide teacher-led educational writing intervention aiming at providing cognitive strategic and conversational support. The writing intervention was systematically and analytically described by means of a reporting system. Following this procedure, the argumentative writing program, consisting of 8 lessons, was more particularly described by defining design principles, instructional teaching activities, and student learning activities.

Knowledge building process and learning outcomes of collaborative research ethics training

Keywords: Computer-supported Collaborative Learning, Design-based Research, Higher Education, Instructional Design

Presenting Author:Anu Tammeleht, University of Helsinki, Estonia; **Co-Author:**Erika Löfström, University of Helsinki, Finland; **Co-Author:**Maria Jesus Rodríguez-Triana, Tallinn University, Estonia; **Co-Author:**Kairi Koort, Tallinn University, Estonia

To better understand how technology could enhance acquisition of research ethics competence in HE, we moved a collaborative ethics resource into an online environment (utilising a Computer-Supported Collaborative Learning (CSCL) approach) and investigated the learning processes of learners. Epistemic evidence was collected as part of design-based research from novice and more experienced researchers (N=43), in the form of group e-portfolios, group discussions, and self-reflections. Compared with previous studies using paper-based training material, the analysis of the learning process (based on the SOLO taxonomy) revealed that groups displayed higher levels of understanding and the need for? facilitator support decreased with the CSCL ethics resource. Moreover, the learners were able to evaluate their learning outcomes quite accurately which may imply that the learner self-assessment could be used to support assessment. The analysis indicated that the scaffolding helped learners advance their understanding. The findings could be used to design online resources for the development of transversal skills other than ethics competence.**Keywords:** research ethics and integrity, design-based research (DBR), knowledge building, CSCL ethics resource

Facilitating conceptual change when high school students are taught about cell membranes

Keywords: Conceptual Change, Design-based Research, Instructional Design, Metacognition

Presenting Author:Leonie Johann, NORD University, Norway; **Co-Author:**Fredrik Rusk, Nord University, Norway; **Co-Author:**Jorge Gross, Otto-Friedrich-Universität Bamberg, Germany; **Co-Author:**Michael Reiss, University College London, United Kingdom

Framed by the Model of Educational Reconstruction (MER), a practical framework for lesson planning, we elaborated goals for teaching that take into account different conceptions students' and scientists hold about cell membranes. To set the goals into action, we designed learning interventions such as modeling activities to visualize the molecular components of cell membrane, and thought experiments to promote analogic reasoning. To evaluate the interventions, we carried out two teaching experiments with each three Norwegian high school biology students aged 18-19, and one researcher/teacher. We could thus follow students' thinking pathways while working with the interventions. The teaching experiments were video-taped, and transcribed. By subsequently applying qualitative content analysis, and linguistic analysis, we deduced their grade of understanding through their altered use of linguistic expressions. Findings suggest that the learning interventions triggered an increased scientific understanding of cell membranes. The analysis of students' thinking pathways showed however that some conceptions were more resilient to change than others. Particularly this seemed to account for conceptions leading to teleological reasoning which we believe is due to that these reflect students' ontological assumptions. It appeared in this regard that visualizations of the chemical nature of membrane structure and discussion of its evolutionary and genetical origin provided fruitful means to challenge these conceptions by illustrating the dynamic character of biological structures. Outcomes of the study may contribute to improving understanding of students' conceptions in regard to cell membrane biology, but also inform aspects of molecular life science teaching, and learning in general.

Session T 11

26 August 2021 15:45 - 16:45

Session Room 14

Single Paper

Instructional Design

Instructional Design in Mathematics

Keywords: Early Childhood Education, Instructional Design, Mathematics, Mixed-method Research, Teaching/Instruction

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Camilla Björklund, University of Gothenburg, Sweden

Toddlers' numerical development: modes of representation in interactive picture book reading

Keywords: Early Childhood Education, Instructional Design, Mathematics, Teaching/Instruction

Presenting Author:Camilla Björklund, University of Gothenburg, Sweden; **Co-Author:**Hanna Palmér, Linnaeus University, Sweden

The project DUTTA studies toddlers' (1-3-year-olds) numerical development by focusing what becomes critical in teaching activities for the toddlers to discern basic features of numbers. One activity developed in the project was interactive book reading, based on a book that emphasizes small quantities. The choice of activity was based on previous research indicating positive learning outcomes from this type of mathematical activity, an activity that simultaneously embraces the child's perspective and encourages interaction and 'number talk'. A picture book was designed based on Variation theory principles, to enable necessary aspects of numbers to be discerned. Preschool teachers read the book to 27 toddlers frequently during one year. Video-documentations of their reading sessions were analyzed and expose the significance of addressing the child's perspective when choosing what representation to emphasize and in what ways connections within and between representations are made. The results also expose what is made possible to learn about numbers in book reading when modes of representation and connections within and between these are made explicit. This study thus contributes with deeper knowledge of the teaching of numbers with toddlers, and problematizes as well as extends the potentials of interactive book reading as a quality-enhancing educational tool.

Eye-tracking for investigating teachers' diagnostic judgments from a process-view

Keywords: Instructional Design, Mathematics, Mixed-method Research, Teaching/Instruction

Presenting Author:Saskia Schreiter, PH Heidelberg, Germany; **Co-Author:**Markus Vogel, University of Education Heidelberg, Germany; **Co-Author:**Tobias Doerfler, PH Heidelberg, Germany; **Co-Author:**Markus Rehm, PH Heidelberg, Germany

One of mathematics teachers' everyday activities is to judge task difficulties. To date, little is known about teachers' cognitive processes that underlie these judgments. Using eye-tracking technology and eye-tracking stimulated recall interviews, this study investigates which task characteristics pre-service teachers ($N = 31$) identify and evaluate when judging the difficulty of fraction tasks. The tasks' difficulty is varied systematically by modifications in instructional design (according to cognitive load theory [CLT]; e.g., split-attention vs. integrated format) and by adjusting the fractions' complexity (e.g., like vs. unlike fractions). In an experimental design it is further investigated whether identification and evaluation processes are influenced by information on the categories of task characteristics to be considered in the judgment (informed vs. uninformed judgment). The results show that mathematical task characteristics are identified more often compared to instructional characteristics. Instructional characteristics are to a large extend not identified. In line with expectations, more difficulty-generating task characteristics – mathematical as well as instructional – are identified with an informed in comparison to an uninformed judgment. The analysis of eye-tracking data shows that informed participants have a higher number of fixations, longer fixation durations and a higher number of transitions on and between instructional characteristics. No significant differences were found in the evaluation processes. These results support the assumption that knowing

about the categories of difficulty-generating task characteristics to be considered in the judgment (informed judgment) enables teachers to focus their attention on those characteristics, which, in turn, results in a higher number of identified difficulty-generating task characteristics.

Preservice preschool teachers' mathematical questions during interactive book reading

Keywords: Early Childhood Education, Instructional Design, Mathematics, Teaching/Instruction

Presenting Author: Emke Op 't Eynde, KU LEUVEN, Belgium; **Co-Author:** Fien Depaepe, KU Leuven, Belgium; **Co-Author:** Lieven Verschaffel, KU Leuven, Belgium; **Co-Author:** Joke Torbeyns, KU Leuven, Belgium

Recent studies demonstrated the effectiveness of interactive book reading for enhancing preschoolers' mathematical development, and pointed to the importance of the quality of the adult-preschooler interaction (Purpura et al., 2017). This interaction quality is determined by the quantity and quality of questions adults formulate during interactive book reading (Barnes & Puccioni, 2016). The purpose of this study was to investigate the quantity and the quality of the mathematical questions preservice preschool teachers propose to formulate during interactive book reading, and their association with teacher competence and picture book characteristics. Participants were 111 preservice preschool teachers. We investigated the quantity (i.e., number) and quality (i.e., abstractness) of their mathematical questions using a video-based instrument, and distinguished between two types of picture books, i.e., mathematical and non-mathematical picture books, in the video's. Departing from Blömeke et al. (2015), we additionally analyzed teachers' (1) mathematical content knowledge, (2) mathematical pedagogical content knowledge, and (3) beliefs about mathematics in general and the teaching and learning of mathematics, with three online questionnaires. Data were analyzed using multilevel analyses. Results revealed that mathematical picture books provoked more and more abstract mathematical questions compared to non-mathematical picture books. There were no significant associations between teacher competence characteristics and the quantity or quality of preservice preschool teachers' mathematical questions. We discuss these findings in view of their theoretical and practical relevance.

Session T 12

26 August 2021 15:45 - 16:45

Session Room 1

Single Paper

Instructional Design

Teaching and Instruction in Early Childhood Education

Keywords: Early Childhood Education, Educational Psychology, Experimental Studies, Instructional Design, Literacy, Teaching/Instruction

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Maria Theobald, Germany

To make or not to make? The effect of expected implementation on children's creative idea selection

Keywords: Early Childhood Education, Educational Psychology, Experimental Studies, Teaching/Instruction

Presenting Author: Kim van Broekhoven, Radboud University, Netherlands; **Co-Author:** Barbara Belfi, Maastricht University, Netherlands; **Co-Author:** Lex Borghans, Maastricht University, Netherlands

Worldwide, teaching methods and pedagogies that give children opportunities to develop creative and innovative competences have risen across primary schools. One of the core elements of these pedagogies is that children are instructed to work on transforming their ideas into tangible and physical products. In this study, we examined whether children automatically select the most innovative ideas when they are instructed to do so and whether expected implementation of ideas into tangible products affects the selection of novel and feasible ideas. The selection of novel ideas requires a certain level of openness, therefore, we also investigated whether children's personality moderates this relationship. To this end, 403 Dutch children in grade 6 (aged 10-13) were asked to select two innovative ideas to improve the use of a stuffed toy elephant with or without the expectation to actual implement these ideas in the classroom. The results showed that children who expected implementation were less likely to select original ideas, but more likely to select feasible ideas than children who had no such expectation. Moreover, children in the implementation condition focused more on feasibility than originality when selecting innovative ideas. We found as well that children high on conscientiousness selected more feasible ideas even though they were instructed to select innovative ideas and did not expect idea implementation. Together, the results highlight the importance for educators to carefully consider whether or not practical components should be part of assignments, and to tailor instruction in assignments to the individual needs of children.

Unfolding interaction during reading with at-risk and not at-risk first and second graders

Keywords: Early Childhood Education, Instructional Design, Literacy, Teaching/Instruction

Presenting Author: Silke Vanparys, Ghent University, Belgium; **Co-Author:** Hilde Van Keer, Ghent University, Belgium

Interactive book reading is an effective method to foster children's language development. Both the frequency and the quality of children's contributions during reading are important attributes to add to the quality of an interactive reading session and thus increase literacy and vocabulary acquisition. Previous studies pointed out that children's chance of being at risk for language and literacy impairments due to their socio-economic, ethnic or minority background or home language, is an important child characteristic defining the effects of the reading activity. Therefore, this research aimed at providing an integrated view on input and interaction patterns during reading with two different groups of 1st and 2nd graders: a group of children with an at-risk background and a group of mainly not-at-risk children. Videos of small group reading sessions (n=30) were transcribed verbatim (i.e. 16h, 53m 23s of interactive book reading), divided in 18 995 single units of language and coded with a good interrater agreement ($k=.84$, p

Dialogic book reading in early childhood classrooms

Keywords: Early Childhood Education, Instructional Design, Literacy, Teaching/Instruction

Presenting Author: Chiel van der Veen, VU University Amsterdam, Netherlands; **Co-Author:** Mireille Smits, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:** Femke van der Wilt, Vrije Universiteit Amsterdam, Netherlands

Interactive picture book reading is a common activity in most early childhood classrooms. Research has shown that interaction during book reading supports children's language ability. Despite all the evidence for the effectiveness of interactive picture book reading, early childhood teachers often times struggle to improve the quality of interaction during picture book reading. In this symposium, we will present the results of two studies in which we (1) explored patterns in teacher-child interaction during interactive picture book reading, and (2) implemented an intervention to support dialogic book reading in early childhood classrooms. Results of our first study indicate that teachers' use of dialogic scaffolds during book reading, such as asking open questions, is related to children's causal reasoning. This highlights the need for future research to focus on supporting teachers in orchestrating dialogic talk during picture book reading. Preliminary insights of an intervention study in which teachers were supported to implement a dialogic book reading approached will be discussed.

Session T 13

26 August 2021 15:45 - 16:45

Session Room 10

ICT Demonstration

Learning and Instructional Technology

Telepresence Robots in Higher Education: A Longitudinal Study

Keywords: Computer-supported Collaborative Learning, E-Learning/Online Learning, Educational Technology, Higher Education

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

This paper presents the results of a longitudinal study to evaluate the use of telepresence robots in higher education. For the first time, N = 35 students (teacher

trainees) took part in four seminars at a German university both via telepresence robot and via Skype videoconference. Overall, we found that these students showed a high acceptance of using telepresence robots in higher education. Their acceptance of the robots was already high at the beginning of the seminars, increased further during the seminars, and exceeded the acceptance of using conventional videoconferences at the end of the seminars. Telepresence robots thus represent a promising option for enabling students to participate interactively in courses if physical participation is not possible for them. Please note: In line with the EARLI 2021 submission guidelines, the following extended summary details on the aims, methods, findings, and significance of the outlined longitudinal study. However, the aim of the ICT demonstration is not only to present the results of this study, but also (and in particular) to showcase a telepresence robot at the conference and to discuss the chances of this technology in the field of education together with the audience.

Telepresence Robots in Higher Education: A Longitudinal Study

Presenting Author:Fabian Wolff, Universität Koblenz-Landau, Germany; **Co-Author:**Jens Möller, University of Kiel, Germany

This paper presents the results of a longitudinal study to evaluate the use of telepresence robots in higher education. For the first time, $N = 35$ students (teacher trainees) took part in four seminars at a German university both via telepresence robot and via Skype videoconference. Overall, we found that these students showed a high acceptance of using telepresence robots in higher education. Their acceptance of the robots was already high at the beginning of the seminars, increased further during the seminars, and exceeded the acceptance of using conventional videoconferences at the end of the seminars. Telepresence robots thus represent a promising option for enabling students to participate interactively in courses if physical participation is not possible for them. Please note: In line with the EARLI 2021 submission guidelines, the following extended summary details on the aims, methods, findings, and significance of the outlined longitudinal study. However, the aim of the ICT demonstration is not only to present the results of this study, but also (and in particular) to showcase a telepresence robot at the conference and to discuss the chances of this technology in the field of education together with the audience.

Session T 14

26 August 2021 15:45 - 16:45

Session Room 4

ICT Demonstration

Teaching and Teacher Education

Asynchronous Online Video-based Modules to Support Mathematics Teachers' Professional Learning

Keywords:E-Learning/Online Learning, Mathematics, Teacher Professional Development, Video Analysis

Interest group:SIG 11 - Teaching and Teacher Education

Video-based professional development has shown great potential to support teacher learning. However, much of the research focuses on face-to-face formats, not capitalizing on the benefits of using digital platforms for professional learning. The XXX project aims to design, develop, and research a web-based form of professional development/teacher education. This ICT demonstration will familiarize participants with the XXX design underlying conceptual rationale, provide a brief experience with an asynchronous online module, and learn about preliminary research results. The asynchronous modules are drawn from a set of existing algebra focused video-based mathematics professional development materials and are designed to be used in three flexible formats: independent, locally facilitated, or expert facilitated. Initial survey and interview results indicate that teachers appreciated the variety of formats and found the online modules useful and engaging. Preliminary RCT research results indicate teachers improved in three key areas: (1) understanding of student solution methods different from their own, (2) use of ideas from the modules within their school curriculum materials and (3) applying questioning strategies to probe student thinking.

Asynchronous Online Video-based Modules to Support Mathematics Teachers' Professional Learning

Presenting Author:Angela Knotts, WestEd, United States; **Co-Author:**Nanette Seago, WestEd, United States

Video-based professional development has shown great potential to support teacher learning. However, much of the research focuses on face-to-face formats, not capitalizing on the benefits of using digital platforms for professional learning. The XXX project aims to design, develop, and research a web-based form of professional development/teacher education. This ICT demonstration will familiarize participants with the XXX design underlying conceptual rationale, provide a brief experience with an asynchronous online module, and learn about preliminary research results. The asynchronous modules are drawn from a set of existing algebra focused video-based mathematics professional development materials and are designed to be used in three flexible formats: independent, locally facilitated, or expert facilitated. Initial survey and interview results indicate that teachers appreciated the variety of formats and found the online modules useful and engaging. Preliminary RCT research results indicate teachers improved in three key areas: (1) understanding of student solution methods different from their own, (2) use of ideas from the modules within their school curriculum materials and (3) applying questioning strategies to probe student thinking.

Session T 15

26 August 2021 15:45 - 16:45

Session Room 2

ICT Demonstration

Learning and Instructional Technology

Communicating Sustainability: Development and Evaluation of an Online Course on Accessible Writing

Keywords:E-Learning/Online Learning, Reading Comprehension, Teaching/Instruction, Writing/Literacy

Interest group:SIG 07 - Technology-Enhanced Learning And Instruction

Nowadays companies are expected to regularly update stakeholders (e.g. investors, the media, and consumers) on the social, environmental, and ethical consequences of their activities. Therefore, sustainability (or corporate social responsibility - CSR) reporting has become increasingly important. While CSR reports are widely adopted by companies, previous research has shown that they are difficult to read and that, unsurprisingly, customers prefer information on sustainability presented with accessible language and in engaging formats, for instance through advertising, social media, and corporate websites. Writing and revision training are broad and long-established areas of research, but — to our knowledge — specific training on writing accessible CSR information has not been developed so far. To fill this gap, we are developing a course (in English) within the online and open access writing centre Calliope. This online course will contain: a brief introduction outlining the course structure and learning outcomes; a textual and audio-visual presentation of theory on accessible communication and CSR content; practical exercises with feedback; and a case study, where students are assigned an extract of a CSR report and are asked to revise it to make it easier to read and visually appealing. Informed by previous research, the course revolves around vocabulary, sentence length/structure, cohesion, visual aspects, and relevance. We plan on testing this course among business/accounting students who have English as their second language. We will give a demonstration of this course and outline its implications, such as ensuring that customers understand sustainability information and, in turn, make informed purchase decisions.

Communicating Sustainability: Development and Evaluation of an Online Course on Accessible Writing

Presenting Author:Alessandra Rossetti, Universiteit Antwerpen, Belgium; **Co-Author:**Luuk Van Waes, University of Antwerp, Belgium

Nowadays companies are expected to regularly update stakeholders (e.g. investors, the media, and consumers) on the social, environmental, and ethical consequences of their activities. Therefore, sustainability (or corporate social responsibility - CSR) reporting has become increasingly important. While CSR reports are widely adopted by companies, previous research has shown that they are difficult to read and that, unsurprisingly, customers prefer information on sustainability presented with accessible language and in engaging formats, for instance through advertising, social media, and corporate websites. Writing and revision training are broad and long-established areas of research, but — to our knowledge — specific training on writing accessible CSR information has not been developed so far. To fill this gap, we are developing a course (in English) within the online and open access writing centre Calliope. This online course will contain: a brief introduction outlining the course structure and learning outcomes; a textual and audio-visual presentation of theory on accessible communication

and CSR content; practical exercises with feedback; and a case study, where students are assigned an extract of a CSR report and are asked to revise it to make it easier to read and visually appealing. Informed by previous research, the course revolves around vocabulary, sentence length/structure, cohesion, visual aspects, and relevance. We plan on testing this course among business/accounting students who have English as their second language. We will give a demonstration of this course and outline its implications, such as ensuring that customers understand sustainability information and, in turn, make informed purchase decisions.

Session T 16

26 August 2021 15:45 - 16:45

Session Room 15

Invited Symposium

Cognitive Science

SIG 12: The role of non-academic skills in writing

Keywords: Achievement, Cognitive Skills, Educational Psychology, Motivation, Quantitative Methods, Self-efficacy, Writing/Literacy

Interest group: SIG 12 - Writing

Chairperson: Teresa Limpó, University of Porto, Portugal

Chairperson: Guido Nottbusch, University of Potsdam, Germany

Discussant: Elke Van Steendam, KU LEUVEN, Belgium

Unarguably, writing relies on a set of academic skills, explicitly taught and systematically practiced in the classroom, such as transcription (i.e., handwriting and spelling), planning, or revising. However, good writers also seem to display a set of non-academic skills, typically not present in the school curricula and therefore not explicitly addressed by teachers. The goal of this symposium is to explore and highlight the role of these skills in writing. In the first contribution, authors examined the effects of executive functions (viz., working memory and inhibition skills) in writing in Grades 2, 4, and 8. At all grade levels, executive functions were found to contribute to writing performance. In the second paper, authors looked for different writer profiles in Grade 11, and how they related to students' characteristics, writing performance, and self-efficacy. Based on self-reported writing processes and writing motivation, authors identified two profiles: high monitoring during writing and high autonomous motivation, and low monitoring during writing and low autonomous motivation. These profiles differed in terms of self-efficacy but not in terms of writing performance. In the third presentation, authors explored the role of mindfulness skills in sixth graders writing, after controlling for well-known writing predictors. Findings indicated that mindfulness skills, specifically acceptance-related skills, contributed to writing performance, above and beyond demographic characteristics, transcription, and executive functions. Overall, the studies presented in this symposium corroborated the role of non-academic skills to produce good writing and highlighted the importance of developing instructional practices to boost them in the classroom.

The role of executive functions in writing: A cross-sectional study across 7 years of schooling

Presenting Author: Naymé Salas, Universitat Autònoma de Barcelona, Spain

Writing development involves the recruitment of a host of academic and non-academic skills. Among the latter, the cognitive underpinnings of writing have interested researchers for decades, especially when trying to understand developing writers' allocation of resources. Current thinking about writing considers low-level executive functions (EFs; e.g., working memory, inhibition) to be instrumental to writing skill. While there is evidence that WM and inhibition are involved in writing, we know very little about fluctuations across time and schooling and about whether they exert a direct or an indirect influence on writing. In this study, we examined the role of WM and inhibition skills in writing across a large developmental span (grade 2 – grade 8). Both direct and indirect effects (via transcription) were considered at the word and sentence level. Participants were 1,337 children (676 boys) attending grades 2, 4, and 8 from Barcelona, Spain. They completed EF, and transcription tasks and wrote an opinion essay and a narrative text. Results showed that EFs impacted text generation both directly and indirectly via transcription skills, in line with previous studies. Moreover, the effect of EFs on writing was attested at all grade levels. Our study thus supports the view that non-academic skills, in particular, WM and inhibition, are involved in written composition over a long developmental span.

Writer profiles: Occurrence and relationship with student characteristics and writing outcomes

Presenting Author: Fien De Smedt, Ghent University, Belgium; **Co-Author:** Yana Landrieu, Ghent University, Belgium; **Co-Author:** Bram De Wever, Ghent University, Belgium; **Co-Author:** Hilde Van Keer, Ghent University, Belgium

The authors explore the presence of different writer profiles in 11th-grade classes, as well as the relationship of these profiles with student background characteristics, students' argumentative writing performance, and students' writing self-efficacy. Based on a cluster analysis of 386 eleventh-grade students' self-reported writing processes and writing motivation, the authors identified two distinct writer profiles: (1) high monitoring during writing and high autonomous motivation and (2) low monitoring during writing and low autonomous motivation. In addition, a significant difference was established in gender and self-efficacy distribution across both writer profiles. However, no statistically significant differences according home language and writing performance were established.

Exploring the relationship between mindfulness and writing skills in sixth graders

Presenting Author: Carolina Cordeiro, University of Porto, Portugal; **Co-Author:** Sofia Magalhães, University of Porto, Portugal; **Co-Author:** Andreia Nunes, University of Porto, Portugal; **Co-Author:** Thierry Olive, CNRS & Université de Poitiers, France; **Co-Author:** São Luís Castro, University of Porto, Portugal; **Co-Author:** Teresa Limpó, University of Porto, Portugal

Mindfulness is an active process, through which individuals focus on the present moment with a non-judgmental attitude and accept the experience they are currently living. These skills seem to play an important role in academic performance. However, past research tended to measure academic achievement through students' grades, which are global indicators of their performance. This study aimed to test the contribution of middle-grade students' mindfulness skills to writing achievement, here used as a specific indicator of academic performance. This effect was tested after controlling for well-known writing predictors: demographic characteristics, transcription skills and executive functions (EFs). One hundred and eighty-seven Portuguese-native speakers in Grade 6 ($M = 11.66$ years) were assessed on several writing skills (viz., handwriting, spelling, text quality), EFs (viz., reasoning, attention, working memory, inhibitory control, cognitive flexibility), and self-reported mindfulness skills. We conducted multiple hierarchical regression analysis. After controlling for demographic characteristics (Step 1), we examined the effects of transcription skills (Step 2), executive functions (Step 3), and mindfulness (Step 4) to writing achievement. Findings indicated that mindfulness skills, specifically acceptance-related skills, had a significant and unique contribution to writing achievement in Grade 6. These are pioneering findings about the contribution of mindfulness to writing performance. Overall, we hypothesised that students with more acceptance-related skills were able to, more easily, focus on the task and ignore distractions, which may explain their enhanced writing performance. However, more research is needed to examine the mechanism through which acceptance and other mindfulness components might be benefiting performance in school activities.

Session U 1

26 August 2021 17:30 - 18:30

Session Room 8

Symposium

Teaching and Teacher Education

Early Childhood Teachers' Professional Competence in Mathematics

Keywords: Early Childhood Education, In-service Teacher Education, Mathematics, Pre-service Teacher Education, Teacher Professional Development

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Lara Pohle, Humboldt-Universität zu Berlin , Germany
Organiser: Lara Pohle, Humboldt-Universität zu Berlin , Germany
Discussant: Simone Dunekacke, Freie Universität Berlin, Germany

Considering early childhood (EC) teachers' professional competence in the field of mathematics is essential in order to understand and foster children's mathematical development. It is regarded as a multidimensional construct which includes affective-motivational (e.g. beliefs and emotions) and cognitive (e.g. knowledge) dispositions, situation-specific skills (e.g. planning skills) as well as performance in real-life classroom situations (Blömeke, Gustafsson, & Shavelson, 2015). Although researchers attempted to link the different facets of professional competence empirically, studies focusing on EC teachers are scarce. The aim of this symposium is to examine the above-mentioned facets of EC teachers' professional competence in mathematics and to analyze relations between them. In order to highlight implications for EC teachers' training *and* practice, we draw on data that was gathered from pre- as well as in-service teachers. Additionally, we include children's achievement in mathematics into one of the analyses intending to provide research with information on factors predicting children's achievement in mathematics. In order to achieve the above-mentioned aim, the symposium includes studies with cross-sectional as well as longitudinal designs. The results are highly relevant with the purpose of understanding the facets of EC teachers' professional competence, their development over time and possible interrelations between them. All in all, the symposium yields valuable information for theory and practice. We hope to involve the audience in fruitful discussions, which will be guided by our discussant.

Preschool teachers' mathematical pedagogical content knowledge and classroom practice

Presenting Author:Febe Demedts, University of Leuven - Campus KULAK, Belgium; **Co-Author:**Fien Depaepe, KU Leuven, Belgium; **Co-Author:**Joke Torbeyns, KU Leuven, Belgium

Teachers' mathematical pedagogical content knowledge (MPCK) is pivotal for instructional quality. Unfortunately, research on preschool teachers' MPCK and its association with opportunities to learn (OTL) this knowledge and teachers' actual classroom practice is scarce. We therefore aimed at (1) investigating the acquisition of MPCK in pre- and in-service preschool teachers differing in theoretical and practical OTL, and (2) analysing preschool teachers' MPCK in association with self-reported instructional quality. A scenario-based MPCK questionnaire was offered to 60 first-year pre-service preschool teachers, 102 second- and third-year pre-service preschool teachers and 75 in-service preschool teachers. Additionally, in-service preschool teachers fulfilled a questionnaire about their classroom practice in the domain of mathematics. First, our results demonstrated that first-year pre-service preschool teachers achieved a lower MPCK score than second- and third-year pre-service preschool teachers, indicating the contribution of theoretical OTL to MPCK. Results about the contribution of practical OTL to the acquisition of MPCK were mixed. On the one hand, second- and third-year pre-service preschool teachers obtained a lower MPCK score than in-service preschool teachers, pointing to the contribution of practical OTL. On the other hand, we observed no correlation between MPCK and years of teaching experience, questioning the association between practical OTL and MPCK. Second, we observed a positive association between teachers' MPCK and the mathematical learning activities they provide. Overall, our findings emphasize the importance of MPCK for instructional quality in preschool mathematics, as well as of development programs, including both theoretical and practical OTL, to enhance the acquisition of this important knowledge.

Performance expectations and learning objectives in early mathematics – Austria and Switzerland

Presenting Author:Karoline Rettenbacher, Karl-Franzens-Universität Graz, Austria; **Co-Author:**Lars Eichen, University of Graz, Austria; **Co-Author:**Manfred Pfiffner, Zurich University of Teacher Education, Switzerland; **Co-Author:**Catherine Walter-Laager, University of Graz, Austria

The planning and offering of educational activities in early childhood education requires knowledge about the children's learning and development as well as about their interests (Walter-Laager & Fasseing, 2017). This paper focusses on the age-appropriate performance expectations as well as the setting and evaluation of learning objectives in early mathematical play situations in Early Childhood Education and Care (ECEC) institutions. In a questionnaire about age-appropriate performance expectations $N = 699$ early childhood educators participated. The pre-service and in-service early childhood educators from Austria ($n = 177$) and Switzerland ($n = 522$) estimated the age cohort in which children would achieve a specific mathematical skill. Additionally, twelve early childhood educators from Austria and Switzerland (AUT = 7, CH = 5) were interviewed about how they choose and evaluate learning objectives when offering a mathematical play situation. The results show that 69% of the surveyed early childhood educators from both countries have too low or too high performance expectations. Significant group differences can be seen regarding the educational status in general and in a country comparison. Concerning the learning objectives, early childhood educators from both countries set similar objectives in the same mathematical content areas. Country differences can be observed in how early childhood educators determine whether set learning objectives were achieved.

Development of Early Childhood Teachers' Knowledge and Emotions in Mathematics

Presenting Author:Lars Jenßen, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Michael Eid, Freie Universität Berlin, Germany; **Co-Author:**Markus Szczesny, TU Braunschweig, Germany; **Co-Author:**Katja Eilerts, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Sigrid Blömeke, Centre for Educational Measurement at the University of Oslo (CEMO), Norway

Domain-related knowledge and emotions represent substantial parts of early childhood teachers' professional competence. Regarding their job tasks related to mathematics, content knowledge, pedagogical content knowledge, anxiety and enjoyment are relevant. The majority of early childhood teachers reports pleasant feelings towards mathematics. However, some also state that they feel uncomfortable when being in math-related situations. Research shows that early childhood teachers' mathematics anxiety affects their professional knowledge in mathematics. Studies revealed that early childhood teachers' professional knowledge in mathematics develops during training, but longitudinal studies from teacher training to practice were missing. The present study investigates the development of $n=129$ early childhood teachers' mathematics content knowledge, mathematics pedagogical content knowledge, mathematics anxiety and enjoyment in mathematics over four years from teacher training to practice. Latent autoregressive models with cross-lagged effects were applied. Scalar measurement invariance of the model also allowed analyses of intraindividual change of the trait variables. Results indicate decline of mathematics anxiety, increase of enjoyment and professional knowledge in mathematics, and medium (emotions) to strong (knowledge) autoregressive but limited cross-lagged effects. No cross-lagged effects between emotions and knowledge over time were found. Theoretically assumed differences between pre-service early childhood teachers' knowledge and emotions (as learners) and in-service early childhood teachers are discussed in light of the results. Implications for early childhood teachers' training are given.

Cognitive and affective-motivational dispositions and children's achievement in mathematics

Presenting Author:Lara Pohle, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Lars Jenßen, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Katja Eilerts, Humboldt-Universität zu Berlin, Germany

Early childhood (EC) teachers' cognitive (knowledge) and affective-motivational (e.g. emotions) dispositions are important when considering children's achievement in mathematics. However, it has not been clarified yet whether cognitive and affective-motivational dispositions are equally important or if either of them is more decisive in terms of children's achievement in mathematics. Resulting from this, this presentation examines the question whether EC teachers' mathematical content knowledge (MCK), their mathematical pedagogical content knowledge (MPCK), their mathematics anxiety and their enjoyment in mathematics predict children's achievement. Data was collected from $n=25$ EC teachers and $n=154$ children. A questionnaire was used to gather information on EC teacher's anxiety and enjoyment in mathematics. Additionally, the teachers completed tests measuring their MCK and MPCK. Children's achievement in mathematics was tested with the help of a standardized instrument. Considering the nested structure of our data, we applied multilevel analysis with children on level 1 and EC teachers on level 2. Results drawn from models with one level 2 predictor show that MPCK and enjoyment predict children's achievement, while this does not apply for MCK and EC teacher's mathematics anxiety. MPCK is also a predictor of children's achievement when enjoyment is controlled for; however, this is not the case for enjoyment when MPCK is controlled for. The results show that knowledge, in contrast to affective-motivational aspects, affects children's achievement levels to a higher extent. Additionally, it can be concluded that EC teachers' MPCK and enjoyment are more important than MCK and anxiety when considering children's achievement in mathematics.

Session U 2

26 August 2021 17:30 - 18:30

Session Room 16

Symposium

Learning and Instructional Technology

YouTube in the classroom and beyond: Comprehension and evaluation of online videos on science topics

Keywords: Comprehension of Text and Graphics, E-Learning/Online Learning, Educational Technology, Metacognition, Reading Comprehension

Interest group: SIG 02 - Comprehension of Text and Graphics

Chairperson: Ladislao Salmeron, University of Valencia, Spain

Organiser: Marc Stadtler, University of Bochum, Germany

Discussant: Carita Kiili, Finland

In the recent years, the use of online videos for learning purposes has proliferated, with 66% of 9-16 year-olds reporting to watch video clips on a daily basis (EU-Kids Online, 2020). While this trend bears potentials for engaging learners with scientific topics (Michalovic & Herskovitz, 2020), doubts have been raised about the depth of learning from this medium (Salmerón, Sampietro, & Delgado, 2020). Due to the open publication principle, learners may view videos of low quality and from dubious sources (Allgaier, 2019). In addition, the seemingly easy presentation of complex contents may seduce learners to overestimate their comprehension and evaluation capabilities. Against this backdrop, the goal of this symposium is to present four empirical studies that center on the comprehension, the metacognitive monitoring and the evaluation of science information from online videos. Presentation 1 examines secondary students' comprehension and metacognitive calibration when learning from science videos. In a similar vein, presentation 2 investigates whether adult learners overtax their own evaluative capabilities when viewing science videos that use a simplified language. Presentation 3 asks how secondary students consider source features when watching videos presenting conflicting scientific information. Presentation 4 examines video as a modality for introducing adult learners to controversial and affectively-laden scientific content. Finally, a joint discussion will be stimulated by a renowned discussant with the support of an online tool that collects questions from the audience throughout the symposium. The expected outcome of the symposium is a better understanding of the potentials and pitfalls of learning from online videos.

'Youtubers' as teachers: Are streaming videos suitable for learning in Secondary education?

Presenting Author:Ladislao Salmeron, University of Valencia, Spain; **Co-Author:**Inmaculada Fajardo, University of Valencia, Spain; **Co-Author:**Ávila Vicenta, University of Valencia / Interdisciplinary Research Structure for Reading Research (ERI Lectura), Spain; **Co-Author:**Øistein Anmarkrud, University of Oslo, Norway; **Co-Author:**Silvia Maria Chireac, University of Valencia, Spain; **Co-Author:**Marco Gómez-Puerta, University of Alicante, Spain; **Co-Author:**Ana Pérez, University of Granada, Spain; **Co-Author:**Nadina Gómez-Merino, University of Valencia / Interdisciplinary Research Structure for Reading Research (ERI Lectura), Spain; **Co-Author:**Pablo Delgado, University of Valencia, Spain

The present study examined the suitability of streaming videos as learning tools in Secondary education. Although potentially being a complement for texts or even substituting them, streaming videos are usually watched for entertainment. This could lead students to develop approaching habits to information characterized by low levels of attention, metacognitive monitoring and in-depth processing. We tested this hypothesis by comparing students' perceived attention to task, metacognitive calibration, and content comprehension between reading texts and watching streaming videos, both presented as Internet blog entries. Furthermore, we explored whether the effect of format, if so, interacts with notetaking and participants' comprehension skill. One hundred and eighty-eight 9th and 10th grade students read two text-blog entries and watched two video-blog entries. Half of them had to take notes about the entries' content. After reading/watching each entry, they completed a questionnaire about their on-task attention, and they predicted their performance on four subsequent comprehension questions. At last, they answered the questions. After controlling for students' attention capacity, situational interest and perceived entries comprehensibility, results indicated the students calibrated and comprehended equally well in both formats. Moreover, although those who took notes perceived themselves to be more distracted than those who did not, especially when reading the text-entries, notetaking helped low-skilled readers to overcome their comprehension difficulties in this format. Streaming videos seems to be as suitable as online texts for learning, although notetaking seems to be helpful for low skilled readers only when reading texts.

Learning about science on YouTube: Simplified language affects laypeople's evaluation of the content

Presenting Author:Marc Stadtler, University of Bochum, Germany; **Co-Author:**Lisa Scharrer, Ruhr-Universität Bochum, Germany; **Co-Author:**Katharina Bauer, University of Bochum, Germany

In the recent years, the use of online videos for learning purposes has proliferated both within and outside the classroom (List & Ballenger, 2019). Younger students, in particular, appreciate the seemingly easy way, in which even complex topics are explained on platforms such as YouTube. Against this backdrop, we examined whether the use of simplified language pervasive in online videos inclines laypeople to overestimate their own capabilities of judging the veracity of contents. A total of forty-six medical laypeople watched videos about different health topics that were either easy or less easy to comprehend. The easy video led participants to agree more strongly and confidently with contained knowledge claims and decreased their desire to consult an expert for support. The findings suggest that informational videos on scientific issues that are easy to comprehend can tempt laypeople to overlook the limits of their own evaluative capabilities.

Expert but not persuasive: do students consider source when processing conflicting videos?

Presenting Author:Colin Lescarret, CLLE-LTC, University of Toulouse, France; **Co-Author:**Franck Amadieu, University of Toulouse, France; **Co-Author:**Valerie Le Floch, University of Toulouse, CLLE, France; **Co-Author:**Jean-Christophe Sakdavong, University of Toulouse, CLLE, France; **Co-Author:**Jean-Michel Boucheix, University of Dijon, LEAD-CNRS, France; **Co-Author:**André Tricot, University of Montpellier, France

The present study aimed at examining how seventh grade students consider source features when watching videos presenting conflicting information on a controversial topic. Students were asked to watch six excerpts from video interviews in which two sources expressed opposing positions on a controversial topic ("Should organic farming feed the entire world population by 2050?"). Interviewees' expertise was varied by presenting each speaker either as (a) a researcher in the field, or (b) a consumer interviewed while shopping. Source memorization was evaluated after watching the videos with a recognition task. Students were then asked to evaluate the credibility (expertise, trustworthiness) of the speakers, select which one they found the most convincing and justify in writing why. Results of the recognition task indicate that students did pay attention to the information provided on source when watching the videos and assessed speakers' credibility accordingly. However, an effect of students' prior attitude on the topic was found on credibility measures and students were prone to judge the interviewee that took a position compatible with their prior attitude as most convincing – while interviewees' expertise on the topic was overlooked. Overall, source expertise does not appear to be a criterion considered enough by middle-school students in assessing the reliability of the controversial information presented the videos - while students' prior attitude on the topic contributes to source evaluation.

Video as a Modality for Introducing Students to Affectively-Laden Issues in Bioethics

Presenting Author:Gala Campos Oaxaca, The Pennsylvania State University, United States; **Co-Author:**Alexandra List, The Pennsylvania State University, United States; **Co-Author:**Hyeyeon Lee, The Pennsylvania State University, United States; **Co-Author:**Bailing Lyu, The Pennsylvania State University, United States; **Co-Author:**Hongcui Du, The Pennsylvania State University, United States

This study examines video as a modality for introducing students to controversial and affectively-laden content in bioethics. In this study, participants were presented with two information sources on the topic of prenatal genetic screening. While the first information source was the same across participants, the second source varied according to modality (i.e., text or video) and positionality (for or against prenatal genetic screening, or considering both sides of the issue). This second resource featured women discussing their personal decision-making regarding prenatal genetic screening; the text version of this resource was a transcript of the video content, with a headshot of each woman speaking, included. Results included that students rated the trustworthiness, interestingness, and persuasiveness of video higher than text, with this effect also interacting with source positionality. Students' recall of the benefits and limitations of prenatal genetic screening was not associated with source modality or positionality, although positionality was associated with students' attitude

stances on pre-natal genetic screening at post-test.

Session U 3

26 August 2021 17:30 - 18:30

Session Room 9

Symposium

Learning and Social Interaction

Teacher-child relationships and related factors in toddler and pre-school classrooms

Keywords: Early Childhood Education, Language (L1/Standard Language), Quantitative Methods, Social Aspects of Learning and Teaching, Social Development, Social Interaction, Teaching/Instruction

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

Organiser: Eija Pakarinen, University of Jyväskylä, Finland

Discussant: Karine Verschueren, KU LEUVEN, Belgium

There is a strong evidence to show the powerful role of teacher-child relationships as facilitators of successful child development and adjustment. However, less is known about the role of teacher-child relationships and teacher-child interaction in younger age as well as the different factors related to teacher-child relationship quality. This symposium is organized to deepen the current understanding on the role of teacher-child relationship quality in enhancing child language and social development during the very early years of education. In addition, the aim of the symposium is to shed light on different child-, teacher- and organization-level characteristics related to teacher-child relationship quality. The first paper examines the longitudinal links between teacher-child relationships and children's expressive vocabulary in toddlerhood in a Portuguese sample. The second paper examines the observed quality of teacher-child interactions in relation to children's social competence in Finnish toddler classrooms. The third paper investigates the factor structure of the STRS instrument in a Greek pre-school sample. Moreover, the effects of different child (gender, age, origin and special educational needs), teacher (teacher gender, age and mood), and pre-school characteristics (school-type, number of children, observed quality), on teacher-child relationships are examined. The three papers presented in the symposium contribute to the scant knowledge base on teacher-child relationship quality and related factors among children of a younger age. The papers also provide reflections on the role of different educational and cultural contexts in quality of teacher-child relationships. Both theoretical and practical implications will be discussed.

Associations Between the Teacher-Child Relationship and Children's Expressive Vocabulary Development

Presenting Author:Jessica Alves, Faculty of Psychology and Educational Sciences of the University of Porto, Portugal; **Co-Author:**Carolina Guedes, Faculty of Psychology and Educational Sciences, University of Porto, Porto, Portugal, Portugal; **Co-Author:**Joana Cadima, University of Porto, Portugal

A well-established body of research has documented the importance of teacher-child relationships for young children's development on cognitive, social, and emotional domains (Doumen et al., 2008; Hamre & Pianta, 2001; Pianta & Stuhlman, 2004). However, little is known about the associations between the teacher-child relationships and children's expressive vocabulary skills in toddlerhood, a widely recognized and understudied sensitive developmental period. The current study aims to examine the longitudinal links between teacher-child relationships and children's expressive vocabulary in toddlerhood. The participants of the study were 209 toddlers (51.9% boys) with an average age of 35.1 months ($SD = 4.10$), and their lead teachers ($n = 36$). Expressive vocabulary skills were individually assessed across two assessment waves, using a task from the Griffiths Language Subscale, and on the second wave teachers reported on their perception about closeness, conflict and dependency with children through the STRS short form. The results suggested that closeness at wave 2 was a positive predictor of expressive vocabulary at wave 2, while neither conflict nor dependency were associated with vocabulary. In addition, expressive vocabulary at wave 1 positively predicted closeness at wave 2. These findings highlight the powerful role of closeness in the development of toddlers' vocabulary, but also the need for considering children's prior vocabulary skills in enhancing nurturing and supporting positive educator-child relationships.

Teacher-child interactions as a context for development of social competence in toddler classrooms

Presenting Author:Jenni Salminen, University of Jyväskylä, Finland; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Anna-Maija Poikkeus, University of Jyväskylä, Finland; **Co-Author:**Marja-Leena Laakso, Universrity of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

The present study investigates the quality of teacher-child interactions in relation to children's social competence in Finnish toddler classrooms. The participants included 242 toddlers (114 girls, 128 boys) and their teachers ($N = 43$). Quality of teacher-child interactions (i.e., emotional and behavioral support; engaged support for learning) were observed with CLASS-Toddler observation instrument (La Paro et al., 2012). Teachers rated toddler's social competence with the Multisource Assessment of Social Competence Scale (MASCS: Juntila et al., 2006), which produced sum scores for toddlers' cooperating skills, empathy, impulsivity, and disruptiveness. The results of the multilevel modeling indicated significant differences between the toddler classrooms in teacher ratings of empathy and disruptiveness. The results further revealed that observed engaged support for learning was positively associated with empathy typical of the classroom in the spring when accounting for previous levels of empathy. In addition, higher variance in engaged support for learning was negatively related to empathy typical of the classroom. At the level of individual children, the results indicated that girls tended to be rated as more empathic by their teachers than boys and older children as more empathic than younger children. The results particularly emphasize the importance of active facilitation and cognitively stimulating and verbally rich support by the teacher in promoting toddlers' emphatic behaviors, a skill that can be bolstered already in the initial teacher training, but also as part of in-service training.

Child-, group- and teacher predictors of child-teacher relationships in Greek pre-schools

Presenting Author:Mirna Sumatic, University of Oxford, United Kingdom; **Co-Author:**Lars-Erik Malmberg, University of Oxford, United Kingdom; **Co-Author:**Athanasiros Gregoridis, Aristotle University of Thessaloniki, Greece; **Co-Author:**Vasilis Grammatikopoulos, International Hellenic University, Greece; **Co-Author:**Evrikidi Zachopoulou, International Hellenic University, Greece

The Student-Teacher Relationship Scale (STRS) is used to capture three aspects of the relationship: *closeness*, *conflict* and *dependency*. In individualistic cultures, a close relationship has been associated with children's academic performance and behavioural adjustment, and conflictual relationships associated with maladjustment and externalising behaviours. We expand previous studies by first investigating the factor structure of the STRS among 2,130 pre-school children and their 267 teachers in a collectivistic culture, Greece. Second, we investigated effects of *child* (gender, age, origin and special educational needs), *teacher* (teacher gender, age and mood), and *pre-school characteristics* (school-type, number of children, observed quality using the Early Childhood Environment Rating Scale-Revised (ECERS-R), on child-teacher relationships. Using multilevel exploratory structural equation modelling (ESEM) we replicated the three-factor solution of the STRS. Importantly, as in other collectivistic cultures, closeness and dependency were positively (not negatively) associated. Multilevel models indicated that teacher characteristics were more strongly associated with teachers' rating of closeness, dependency and conflict, than child characteristics. Children's gender and teachers' emotions were found to be consistently associated with all three dimensions of the STRS. Children with special educational needs (SEN) were also found to have lower ratings of closeness and higher ratings of conflict and dependency. In conclusion, the STRS can capture the relationship quality accurately in a Greek early years setting, and the analysis has demonstrated that the three STRS dimensions are associated with different child and teacher characteristics.

Session U 4

26 August 2021 17:30 - 18:30

Session Room 1

Symposium

Motivational, Social and Affective Processes

Looking to the role of interaction processes for learning-related emotions

Keywords: Cooperative/Collaborative Learning, Mixed-method Research, Motivation and Emotion, Self-regulation, Social Aspects of Learning and Teaching, Social Interaction, Teaching Approaches, Video Analysis

Interest group: SIG 08 - Motivation and Emotion, SIG 16 - Metacognition

Chairperson: Hanna Jarvenoja, University of Oulu, Finland

Organiser: Jonna Malmberg, University of Oulu, Finland

Discussant: Jeff Greene, University of North Carolina, United States

The aim of this symposium is to consider the different viewpoints on the role of emotions for learning from the process-oriented perspective. It collects together studies that implement data sources that enable to analyse emotions temporally as they occur in interaction and relate it with other aspects of learning and performance. The symposium is composed of four papers. The first paper by Kazemita & Lajoie focuses on the impact of emotion regulation when challenges are encountered in a competitive team performance situation. The study implements multiple data sources to define emotion regulation strategies in relation to challenges encountered during interaction. The second paper by Malmberg et al. relies on video data from collaborative groups and implements temporal analysis to investigate how emotion and motivation participate in monitoring activities in different phases of regulated learning from an individual group member's perspective. The third paper by Törmänen et al. employs multiple process data sources, namely video, physiological data, and self-reports, to explore situational emotional conditions for socio-emotional interactions taking place during collaborative learning. Finally, the fourth paper by Mainhard et al. focuses on the meaning of interpersonal teacher-student interaction for students' emotions by combining video coding of students and teachers behaviour with teacher's physiological reactions on one hand and students' lesson-focused emotions on the other hand. In the discussion, the complementarity of the different studies is elaborated. The four studies are contrasted in terms of choice, justification and implementation of data and measures as well as in terms of their theoretical underpinnings.

Emotion Regulation in Socio-Emotionally Challenging Learning Contexts: A Case Study Approach

Presenting Author: Maedeh Kazemita, Tehran University, Iran; **Co-Author:** Susanne Lajoie, McGill University, Canada

Research has demonstrated the power of emotion regulation in managing challenges students face in different learning contexts. However, emotion research in team-learning where challenges become more evident is still in its infancy. In this paper we analyze the impact of emotion regulation when challenges are encountered in competitive team performance during a hackathon. A case study approach is presented that examines differences in a high and a low performing team. Using a mixed-methods approach, we analyze team interactions to determine the type of emotion regulation strategies students apply and the types and intensity of challenges they encounter. Comparative excerpts as well as descriptive statistics are provided to show differences among the cases. Our findings showed that the high performing team applied more shared emotional regulation and in most cases faced external challenges effectively; whereas the low performing team applied less shared emotional regulation, experienced both external challenges and internal challenges (referring to relational problems, trust breakdown and conflict), and experienced a frustrating and unpleasant team experience overall.

How Individual Students' Monitoring Events Occur During Collaborative Learning - A Network Analysis

Presenting Author: Jonna Malmberg, University of Oulu, Finland; **Co-Author:** Mohammed Saqr, University of Eastern Finland, Finland; **Co-Author:** Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:** Sanna Järvelä, University of Oulu, Finland

The current study uses within-person temporal and sequential analysis to understand the individual learning process as a part of the collaborative learning process. Contemporary perspectives of self-regulated learning (SRL) acknowledges monitoring as a crucial mechanism for both individuals' and groups' learning progress. Despite the importance of monitoring at each phase of the regulated learning cycle, little is known about how individual students' monitoring is related to these phases in collaborative learning contexts and, furthermore, how it is connected with motivation and emotion and their regulation during collaboration. This study addresses this gap by investigating how monitoring coexists temporally and progress sequentially during collaborative learning. Twelve high school students participated in an advanced physics course and collaborated in groups of three for twenty 90-minutes learning sessions. Each student's monitoring events were first identified from the videotaped collaborative learning sessions and then associated with the regulation phase. In addition, students' reactions for each monitoring event was also coded from video. The results show that cyclical phases of regulation do not coexist. However, when looking at temporal and sequential aspects of monitoring, the results show that motivation and emotions predict monitoring task definition, which leads to task enactment and reaction. The study results suggest that motivation and emotions are embedded in regulation phases, and in the context of collaborative learning. The current study sheds light on idiographic methods that have implications for individual learning analytics.

Group members' situational socio-emotional conditions during collaborative learning

Presenting Author: Tiina Törmänen, University of Oulu, Finland; **Co-Author:** Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:** Sanna Järvelä, University of Oulu, Finland

Previous research links positive emotions to group interactions and collaboration, whereas negative emotions to disengagement and social loafing. Less is, however, known on how emotions function in the interaction during collaborative learning. To unravel this functioning, this study examined group members' emotional states reflected in ongoing collaborative interactions. First, the study explored situational socio-emotional conditions by operationalizing them with the dimensions of valence and arousal. The aim was to unravel how the emotional valence of group members' interaction is reflected in group members' sympathetic arousal. Second, the study aimed to explore how situational socio-emotional conditions and socio-emotional interaction together predict group members' interpretations of collaboration. The participants were 7th grade students ($N=39$) performing collaborative science tasks in groups across four learning sessions. The data were collected with multichannel process data (video, electrodermal activity; EDA, situated self-reports) in an authentic classroom. The results revealed that during positive, negative and mixed socio-emotional interactions group members had more NS-SCR peaks in their EDA data than during neutral interactions. This result strengthens the findings indicating that valence and arousal reflect two different dimensions of the emotional circumplex and the sympathetic arousal can reflect the physiological component of emotions. The results indicated also that participation in positive interaction predicts positive evaluations of collaboration in addition to group members' pre-evaluations demonstrating that the function of emotions is two-folded: it is based on the interplay between individual students' socio-emotional conditions before collaboration as well as operations occurring between the group members during collaboration continuously changing these conditions.

Teachers' Physiological Effort and Behavioral Instability Undermine Positive Effects of Support

Presenting Author: Tim Mainhard, Utrecht University, Netherlands; **Co-Author:** Monika Donker, Utrecht University, Netherlands; **Co-Author:** Tamara Van Gog, Utrecht University, Netherlands

Student perceptions of teacher interpersonal warmth and support positively affect student emotions. However, next to average interpersonal warmth also the degree to which warmth is conveyed in a continuous, stable fashion rather than in a fragmented way may add to positive student experiences (Mainhard et al. 2012). In addition, if showing interpersonal warmth during class is effortful (teacher emotional labour), this may undermine positive effects. We tested these assumptions by using classroom observations to assess level and (in-) stability of teacher warmth and ambulant measures of teacher heart rate to gauge the physiological effort teachers put into being warm and supportive during class. The interpersonal behavior of 80 teachers and their students ($N=1762$) was coded from moment to moment based on video recordings using Continuous Assessment of Interpersonal Dynamics (CAID; Sadler et al., 2009). Teachers' heart rate was measured continuously during the lesson (VU-AMS; De Geus et al., 1995). When students perceived more interpersonal teacher warmth, students reported more positive and less negative emotions. Higher variability in teacher warmth was related to more negative emotions. No direct effect of teacher physiological effort when being friendly was found. However, the physiological effort teachers put into showing interpersonal warmth accounted for random slope variance in the association between teacher warmth and student emotions, especially with regard to negative student emotions. That is, the more effort a teacher put into showing interpersonal warmth, the less teacher warmth protected students from experiencing negative lesson-focused emotions.

Session U 5

26 August 2021 17:30 - 18:30

Session Room 4

Poster Presentation

Assessment and Evaluation, Developmental Aspects of Instruction, Learning and Instructional Technology

Learning Technologies

Keywords: Assessment Methods and Tools, Competencies, E-Learning/Online Learning, Early Childhood Education, Educational Technology, Emotion and Affect, Language (Foreign and Second), Learning Analytics, Learning Technologies, Literacy, Primary Education, Teacher Professional Development, Teaching/Instruction, Technology

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 18 - Educational Effectiveness and Improvement, SIG 27 - Online Measures of Learning Processes

Chairperson: Stephanie Pieschl, Technical University of Darmstadt, Germany

Engagement and Formative Assessment Mediate the Relation between Attendance and Academic Performance

Keywords: E-Learning/Online Learning, Learning Analytics, Learning Technologies, Teaching/Instruction

Presenting Author: Chang Lu, University of Alberta, Canada; **Co-Author:** Maria Cutumisu, University of Alberta, Canada

In traditional school-based learning, attendance was regarded as a proxy for engagement and a key indicator for performance. However, few studies have explored the effect of in-class attendance in technology-enhanced courses that are increasingly provided by secondary institutions. This study collected n=367 undergraduate students' log files from Moodle and applied learning analytics methods to measure their lecture attendance, online learning activities, and performance on online formative assessments. Structural equation modeling was used to investigate whether online learning engagement and formative assessment mediated the relationship between lecture attendance and course academic outcomes. Results show that attendance does not have a direct effect on academic outcomes, but it promotes performance by leveraging online learning engagement and formative assessment performance. Findings contribute to understanding the impact of in-class attendance on course academic performance in the context of technology-enhanced courses and recommend using a variety of educational technologies to pave multiple pathways to academic success. **Keywords:** attendance; performance; engagement; formative assessment; learning analytics; learning management system

Outcomes of a large-scale development project about differentiation and digital technologies

Keywords: Early Childhood Education, Learning Technologies, Primary Education, Teacher Professional Development

Presenting Author: Johanna Lundqvist, Mälardalen University, Sweden; **Presenting Author:** Karin Franzén, Karlstads University, Educational Studies, Sweden; **Presenting Author:** Gun-Marie Wetsö, Mälardalens University, Sweden; **Co-Author:** Margareta Sandström, Mälardalens högskola, Sweden; **Co-Author:** Ulrika Larsdotter Bodin, Mälardalen University, Sweden; **Co-Author:** Petra Runström Nilsson, Mälardalen University, Sweden

In this study, the outcomes of a large-scale co-production development project concentrated on differentiated instruction and digital technologies in Swedish preschools and primary schools are described and analysed. The co-production was between academia (i.e. Mälardalen University) and teachers/head teachers (N=243) working in seven municipalities in the Mälardalen region. A mixed method approach was adopted, and the data were collected before, during and after the project by means of recaps, research circles and a questionnaire. Thematic and numerical analyses were conducted. Changes in the participants' knowledge and uses emerge. The themes (preliminary, types of outcomes) are, to give some examples: new professional acquaintances; enhancements of professional language; confirmations; insights; new knowledge; courage; improvement efforts; changes at a preschool and primary school classroom level; experiences of setbacks and preschool and primary school development challenges; new/revised guidelines and policies, and new tools for self-reflection and evaluation efforts. Influential factors and activities in the project that seem to have generated these changes and outcomes are discussed, and suggestions for further research are provided. The study can form a basis for interesting preschool and school development discussions on the topics of pedagogical differentiation and digital technologies.

Exploring students' emotions during learning with adaptive learning technology:a multimodal approach

Keywords: Emotion and Affect, Learning Analytics, Learning Technologies, Primary Education

Presenting Author: Anne Horvers, Radboud University Nijmegen, Netherlands; **Co-Author:** Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:** Tibor Bosse, Radboud University Nijmegen, Netherlands; **Co-Author:** Ard Lazonder, Radboud University, Netherlands

Adaptive learning technologies (ALTs) capture rich traces of data about students' learning. These ALTs successfully adjust the difficulty of problems to students' ability level but often neglect the role of emotion in learning. Previous research shows emotion has a direct influence on learning, but little is known about emotion during learning with ALTs. Therefore, this study applies a multimodal approach to gain insight into emotion during learning with an ALT. Grade five students will solve simplifying fractions problems with an ALT. Physiological measurements are used to indicate arousal, self-reports to indicate valence, and observations to indicate the emotion type. The objective of this study is to explore when emotions occur during learning with an ALT and to gain insight into the relation between emotions and learning using these multimodal data streams.

Measuring the Development of ICT Skills for Personalized Learning

Keywords: Assessment Methods and Tools, E-Learning/Online Learning, Primary Education, Technology

Presenting Author: Kevin Ackermans, Open University, Netherlands; **Co-Author:** Marjoke Bakker, Hogeschool van Arnhem en Nijmegen (HAN), Netherlands; **Co-Author:** Pierre Gorissen, HAN University of Applied Sciences, Netherlands; **Co-Author:** Gino Camp, Welten Institute - Open University of the Netherlands, Netherlands; **Co-Author:** Anne-Marieke van Loon, HAN University of Applied Sciences, Netherlands; **Co-Author:** Marijke Kral, HAN University, Netherlands

Our study investigates the development and validation of a questionnaire for competencies learners need to learn in a personalized way using ICT. 9 Dutch schools for primary education collaborate to make personalized learning with ICT evidence-informed. At these 9 iXperium schools, multidisciplinary design teams (consisting of primary school teachers and principals, teachers and students of the teacher-training program of a Dutch university of applied science, researchers from a Dutch university, and external ICT experts) design and research integrated interventions for PL with ICT. We defined personalized learning conditions before filtering the twenty-four learning objectives needed to measure development in personalized learning using ICT. The final questionnaire consists of thirty-three questions to cover the learning objectives. The validity and reliability of our questionnaire are analyzed in six steps. Cognitive validity (1) and a response model (2) are reported based on literature and a pilot with three iterative rounds of interviews (n=19). Internal constancy (3), confirmatory factor analysis (4), coefficient H (5) are reported after the first run of the questionnaire (n=800), and a test-retest alpha is reported after the second run of the questionnaire (n=800).

Teacher evaluation of technology usage and assessment of an educational digital platform

Keywords: Assessment Methods and Tools, E-Learning/Online Learning, Learning Technologies, Primary Education

Presenting Author: Natalia Lara Nieto-Márquez, Universidad Camilo José Cela, Spain; **Co-Author:** Manuel Iglesias Soilán, Universidad Complutense de Madrid, Spain; **Co-Author:** Elisa Martín Dobón, Universidad Complutense de Madrid, Spain

Under the exceptional situation of the 2020 pandemic, many schools have increased their search for digital resources to continue with the classes. Thus, this study proposes an evaluation from the teaching perspective of their training and overviews with the use of technology in general. It also assesses the case of a specific educational platform that was offered for free during the confinement. For this purpose, we have elaborated a specific instrument to carry out the assessment. Every item is structured by a Likert scale 1 to 5 and also includes some open questions. This instrument was distributed by google forms to teachers and schools that used the Smile and Learn platform. In this way, the analysis of the results of the instrument shows an overall average higher than 3. For the analysis of the instrument, descriptive analyzes, correlations, factorial analysis and reliability tests have been carried out. Following, the teacher's perspective on the use of digital material in the classroom is discussed. In this point it is highlighted the good attitude of teachers towards the implementation of

technology in the classroom, however, they have found limitations when implementing many resources in their schools. In relation to the evaluation of the Smile and Learn platform, teachers stress that it is intuitive to use, as well as motivating students. It is concluded that there is still work to be done to improve digital resources and the implementation of digital material in schools. The teachers' perspective is also important for these processes.

Digital competencies of literacy educators and the effective use of an innovative search engine

Keywords: Competencies, Educational Technology, Language (Foreign and Second), Literacy

Presenting Author: Mareike Kholin, German Institute for Adult Education - Leibniz Centre for Lifelong Learning, Germany; **Co-Author:** Zarah Weiss, Department of Linguistics, University of Tübingen, Germany; **Co-Author:** Heiko Holz, Department of Linguistics, University of Tübingen, Germany; **Co-Author:** Detmar Meurers, Department of Linguistics, University of Tübingen, Germany; **Co-Author:** Simone Jambor-Fahlen, Mercator Institute for Literacy and Language Education, Cologne, Germany; **Co-Author:** Nadine Mayer, Mercator Institute for Literacy and Language Education, Cologne, Germany; **Co-Author:** Michael Becker-Mrotzek, Mercator Institute for Literacy and Language Education, Cologne, Germany; **Co-Author:** Josef Schrader, German Institute for Adult Education - Leibniz Centre for Lifelong Learning, Germany; **Co-Author:** Hannes Schröter, German Institute for Adult Education - Leibniz Centre for Lifelong Learning, Germany

Although the need for digital innovation in adult education had been apparent before, the corona crisis has shown the high importance of new tools and concepts in this area even further. At the same time, the conditions for an effective use of digital tools by educators are yet to be revealed. This paper focuses on an open-access search engine (KANSAS). It is designed to support educators of literacy and German as second language (GSL) courses to find suitable reading material for their participants, regarding both content and linguistic characteristics. Recent research shows that adult educators evaluate KANSAS as useful tool (Kholin et al., 2020). However, it remains unclear under which conditions educators optimally benefit from KANSAS when searching and selecting appropriate texts for a defined target group. We investigate the role of digital competencies for an effective use of a digital tool like KANSAS. We propose that higher as compared to lower self-assessed digital competencies are related to more appropriate research results. Therefore, we plan an online evaluation study with 40 educators of literacy and GSL courses. Participants will search for reading material for adult students with defined low literacy skills using KANSAS, and draft lesson plans based on their chosen text. Two experts of didactics will rate the quality of the chosen reading material and lesson plans independently. The planned statistical methods are hierarchical multiple regression analyses. Results will be presented and discussed during the conference.

Session U 6

26 August 2021 17:30 - 18:30

Session Room 13

Poster Presentation

Assessment and Evaluation, Cognitive Science, Learning and Social Interaction

Mathematics in Early Childhood Education

Keywords: Cognitive Development, Cognitive Skills, Competencies, Early Childhood Education, Educational Psychology, Mathematics, Numeracy, Student Learning, Teaching Approaches, Video Analysis

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 22 - Neuroscience and Education

Chairperson: Laurie Delnoij, Open University, Netherlands

The relation between Structural Quality and Math Talk in Early Childhood Education

Keywords: Early Childhood Education, Mathematics, Teaching Approaches, Video Analysis

Presenting Author: Johanna Klemm, Otto-Friedrich-Universität Bamberg, Germany; **Co-Author:** Simone Lehrl, Otto-Friedrich-Universität Bamberg, Germany; **Co-Author:** Anja Linberg, German Youth Institute, Germany; **Co-Author:** Dorothea Dornheim, Otto-Friedrich-Universität Bamberg, Germany; **Co-Author:** Nadine Besser, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:** Franka Baron, German Youth Institute, Germany

Based on the structure-process model of educational quality in early childhood education and care settings, the author aims to examine the relation between structural quality factors and a domain-specific process component known as math talk. The model exhibits the connection between stable structural quality components, educational beliefs of educators and process quality. The latter covers interactions between children and adults, peers and materials. It can be distinguished between general and domain-specific quality, e.g. mathematics. Early math-specific interactions are a central focus of math education, especially math talk which is a language-based method to foster mathematical competencies in young children. Evidence suggests a positive influence of using math talk during interaction on mathematical competencies of young children. However, little is known which aspects of the classroom and teacher characteristics explain variety in math talk use in toddler's classrooms. Thus, the present poster explores the relation between structural quality and math talk use in toddler's classrooms.

Early numerical knowledge, its relation to language skills and the importance of social disparities

Keywords: Competencies, Early Childhood Education, Mathematics, Numeracy

Presenting Author: Nadine Besser, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:** Dorothea Dornheim, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:** Simone Lehrl, University of Bamberg, Germany; **Co-Author:** Anja Linberg, Otto-Friedrich-University of Bamberg, Germany

Already at the age of three, differences in children's mathematical abilities are evident. This is of particular importance as these early skills predict later child competences. Studies indicate that early competences develop depending on social disparities, such as children's individual characteristics, family background and time spent in early childhood education and care. However, little is known about early influences on mathematical abilities of children aged two years. Therefore, by running stepwise regression analyses, the present paper investigates whether early differences in numerical abilities of children between the ages of two and three years can be explained by social disparities. Because data collection is due to the Corona Pandemic still in progress, the description of the sample, the report and the discussion of the results must be omitted by now. At the conference, the results are presented and discussed regarding their relevance for child development and possible implications for practice.

Finger patterns and cardinality

Keywords: Cognitive Development, Early Childhood Education, Educational Psychology, Mathematics

Presenting Author: Jasetxu Orrantia, University of Salamanca, Spain; **Co-Author:** David Munez, National Institute of Education / Nanyang Technological University, Singapore; **Co-Author:** Rosario Sánchez, University of Salamanca, Spain; **Co-Author:** Laura Matilla, University of Salamanca, Spain

The cardinality principle represents a crucial milestone in the development of early numerical skills. However, relatively few studies have investigated how children's grasping of the cardinality principle can be supported. It has been suggested that the richness of number inputs children receive influences the acquisition of the cardinality. In line with these assumptions, finger patterns may play a functional role in numerical development by facilitating the learning of cardinality through the assignment of symbols to quantities. However, no study has investigated to what extent efficiency to process finger configurations is related to learning of number semantics in young children who have received only minimal formal math instruction. The goal of this study was to examine the relationship between 3-year-old children's efficiency to process finger patterns and their ability to understand the cardinality. Results showed that efficiency to process finger patterns was found to correlate with the children's ability to understand the cardinality, after controlling for age, counting sequence, visual working memory capacity, dice patterns, and fine motor skills, $pr = .36$, $p < .05$. Our findings support educational practices encouraging the representational role of finger patterns as a potential bridge between number words and the amounts they represent.

Cognitive correlates of early math abilities and finger gnosis

Keywords: Early Childhood Education, Educational Psychology, Mathematics, Student Learning

Presenting Author: Jasetxu Orrantia, University of Salamanca, Spain; **Co-Author:** David Munez, National Institute of Education / Nanyang Technological

University, Singapore; **Co-Author:**Rosario Sánchez, University of Salamanca, Spain; **Co-Author:**Laura Matilla, Univeresity of Salamanca, Spain

We investigated whether finger gnosis were uniquely associated with different early math abilities in preschool children, whether the strength of that association was similar across early math abilities, and whether that association changed as a function of children's age. We formulated a measurement model of the early math abilities that were evaluated. A one-factor CFA for early math abilities showed a poor fit ($\chi^2(5) = 25.44$, CFI = .90, RMSEA = .140). A two-factor model to differentiate magnitude-based skills (F1) and counting/finger abilities (F2) showed a good fit ($\chi^2(4) = 4.13$, CFI = .99, RMSEA = .012). Finger gnosis showed a large-size correlation with both factors, explaining (29% and 23% of the variance of F1 and F2, respectively). Including the domain-general covariates did change the role of finger gnosis substantially and halved the correlation with both factors ($\chi^2(22) = 33.27$, CFI = .97, RMSEA = .050). The effect of finger gnosis on each factor was substantially larger for younger children. Indeed, the effect of finger gnosis was not significant for older children (the 95% CI cross zero). This indicates that the association between finger gnosis and math vanishes over development. Figure 2 shows the interaction effect.

Is there any differences between the recognition and production of finger numeral representations?

Keywords: Early Childhood Education, Educational Psychology, Mathematics, Numeracy

Presenting Author:Rosario Sánchez, University of Salamanca, Spain; **Co-Author:**Josetxu Orrantia, University of Salamanca, Spain; **Co-Author:**David Munez, National Institute of Education / Nanyang Technological University, Singapore; **Co-Author:**Laura Matilla, Univeresity of Salamanca, Spain

In the past few years, there has been an increasing interest in analysing the connection between finger processing and the development of various numerical skills (Andres et al., 2008; Fayol y Seron, 2005). Some studies have focused in children's recognition of finger numeral representations presented in a canonical and non-canonical way, whereas other studies have analysed the production of these finger representations (Gunderson et al., 2015; Nicoladis et al., 2010, 2018). However, no study has explored the differences between recognition and representation and their relation with mathematics achievement. Therefore, the aim of this study is to analyse the differences in response time and accuracy between two tasks of finger processing (recognition and reproduction), and explore whether kindergarteners' abilities in finger processing is related to mathematics achievement. Results show that differences between tasks are only found in response time (not in accuracy), being children faster in reproducing finger representations rather than in recognizing them. Nevertheless, the variable that seem to influence mathematics achievement above the influence of domain general variables is the recognition of finger representations. This finding would support the use of finger recognition task in educational practice at early ages.

The association of cardinal finger patterns and quantity-number concepts in early childhood

Keywords: Cognitive Development, Cognitive Skills, Early Childhood Education, Mathematics

Presenting Author:Roberta Barrocas, Leibniz Institut für Wissensmedien, Germany; **Co-Author:**Stephanie Roesch, University of Tuebingen, Institute of Education, Germany; **Co-Author:**Julia Bahnmueller, Loughborough University, United Kingdom; **Co-Author:**Korbinian Moeller, Loughborough University, United Kingdom

Through repeated use of fingers for counting and representing numerical magnitudes in early childhood, specific finger patterns become associated with the mental representations of specific quantities (e.g., thumb and index finger for two). Although children as young as three years old already use their fingers for representing numerical quantities, evidence on advantageous recognition of canonical compared to non-canonical finger patterns as well as its association with numerical development in children this young is scarce. In this study, we investigated the performance of N=109 3-5-year-old children in canonical vs. non-canonical finger pattern recognition and its concurrent association with abilities tapping into quantity-number concepts. Extending previous findings observed for older children, the present results indicated that performance in recognizing canonical finger patterns was better compared to non-canonical finger patterns. Moreover, performance finger pattern recognition significantly predicted quantity-number-concepts when controlling for age, working memory, and domain-specific numerical knowledge (i.e., counting abilities). Overall, these results indicated that the effect of canonicity in finger pattern recognition arises even earlier during numerical development than previously reported. Moreover, results suggest that finger pattern recognition seems to be associated with quantity-number concepts beyond the influence of age, WM, and domain-specific variables and, thus, corroborate the notion that the use of fingers may play a critical role for children's early numerical development.

Session U 7

26 August 2021 17:30 - 18:30

Session Room 2

Symposium

Teaching and Teacher Education

Learning in the School Practicum Mentoring as professional development for student & mentor teachers

Keywords: Content Analysis, Mixed-method Research, Motivation, Pre-service Teacher Education, Qualitative Methods, Quantitative Methods, Social Interaction, Teacher Professional Development

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Clara Kuhn, University of Salzburg, Austria

Organiser: Gerda Hagenauer, University of Salzburg, Austria

Discussant: Kari Smith, Norwegian University of Science and Technology, Norway

During their professional education, student teachers go through various school practicums that usually involve mentorship by established teachers. These practicums are not only an important learning opportunity for student teachers but also for their mentors. Various individual and contextual factors contribute to the effectiveness of these opportunities for both parties. The first presentation within this symposium examines the importance of the quality of mentoring for these learning opportunities. Using a mixed-methods approach, it investigates the factors that can predict mentoring quality, as defined by student teachers—a key perspective, given that mentoring quality is a predictor for student teachers' competence development during their internships. The second presentation, through a triangulation of qualitative methods, looks at the learning opportunities for mentor teachers within long-term practice-based teacher education. This presentation highlights how mentoring can be an important aspect of mentor teachers' professional development, and how their motivations and attitudes towards teaching students are decisive for their own learning in such settings. Relatively, it is to be expected that teachers' initial motivations for becoming mentors can have an impact on the learning opportunities available to both mentor and student teachers. The third presentation, drawing on the expectancy-value theory, explores established teachers' motives for becoming mentors through qualitative analysis of interview data. The overall goal of this symposium, and the focus of its final segment, will be discussing how to design teacher practicums in a way that provides the highest quality mentoring possible.

Mentoring quality of internship in teacher education – individual and mentoring related predictors

Presenting Author:Isabelle Grassmé, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany; **Co-Author:**Antje Biermann, Saarland University, Germany; **Co-Author:**Michaela Gläser-Zikuda, University of Erlangen-Nuremberg, Germany

There is a strong agreement on core competencies of teachers in the 21st century (European Commission, 2013). Regarding the „holy grail of teacher education“ (Darling-Hammond, 2014), integrating practice in teacher education is highly relevant. Preservice teachers' learning opportunities during internship, as well as instructional and emotional support, and feedback by the mentor have been identified as important (Izadinia 2016). Mentoring quality predicts preservice teachers' competence development during internship (Grassmé et al., 2018). Based on the “offer-and-use model of practical training in teacher education” (Hascher & Kittinger, 2014), the present study aims at predicting mentoring quality. A total of $N = 884$ (77.4% female; $M_{Age} = 22.85$ years) preservice teachers participated in a survey. Standardized scales were applied to measure different dimensions of mentoring quality on the one hand and predictors on the other hand, such as 1) preservice teachers' activation during internship, 2) their seizure of learning opportunities during internship, 3) their pre-experiences in education, 4) their vocational choice motivation, and 5) their personality. Multiple regression analysis resulted in a predictive power for the variables activation by

the mentor, taking learning opportunities, and preservice teachers' conscientiousness regarding mentoring quality. Qualitative content analysis of interviews with five preservice teachers who participated in different internships specified these results in more detail. Theoretical background, results and implications to ensure mentoring quality in teacher education will be presented and discussed.

Learning opportunities for mentor teachers in practice-based teacher education

Presenting Author:Tina Hascher, University of Bern, Institute of Educational Science, Switzerland; **Co-Author:**Anja Winkler, University of Teacher Education Bern, Switzerland; **Co-Author:**Daniela Freisler, Pädagogische Hochschule, Institut Forschung & Entwicklung, Bern, Switzerland; **Co-Author:**Christiane Ammann, Pädagogische Hochschule Bern, Switzerland

Practice-based teacher education is becoming increasingly important in teacher education. Although little is known about the use and effects of long-term practice-based teacher education, it is regarded as an ideal setting to develop professional competencies (Ingersoll, 2012). Due to duration, intensity and continuity, long-term practice-based teacher education is considered to be particularly conducive to learning for students. In these settings, student teachers collaborate intensively with their mentor teachers, which in turn provides learning opportunities not only for student teachers but also for mentor teachers (Hollweck, 2019). Using two different methodological approaches, this study examines the learning opportunities for mentor teachers through mentoring a long-term practice-based phase P3 at the Institute of Lower Secondary Education of the XX University of Teacher Education. Rating conferences (focus groups based on short questionnaires) with 30 mentor teachers as well as semi-structured interviews with 17 mentor teachers in different functions within teacher education reveal a variety of learning opportunities for mentor teachers primarily based on active reflections on instructional quality. Also, it was found that the motivation and the attitude towards mentoring student teachers are decisive for the learning processes of mentor teachers.

Why did you become a mentor teacher? A qualitative study on the motives to become a mentor teacher

Presenting Author:Clara Kuhn, University of Salzburg, Austria; **Co-Author:**Gerda Hagenauer, University of Salzburg, Austria; **Co-Author:**Alexander Groeschner, Friedrich Schiller University Jena, Germany

Student teachers consider their mentor teachers and the experiences gained during their practicum to be among the most important aspects of their teacher preparation programme. Mentor teachers play an important role in their mentees' professionalization and are considered as role models for student teachers. Evidence shows that a teacher's decision to voluntarily become a mentor teacher has an impact on the quality of mentoring. Yet, little is known about what motivates teachers to become mentors. This study examines these motives, drawing on the theoretical framework of Eccles and colleagues' expectancy-value theory (EVT) and the Factors Influencing Teachers Choice (FIT-Choice) Model rooted in EVT (Watt et al., 2012). This qualitative study involves guided interviews with N=23 secondary mentor teachers in Austria. The interviews were transcribed verbatim and analysed in MAXQDA following Mayring's (2015) structuring qualitative content analysis. Findings show that teachers commonly choose to become mentors for several reasons: competence beliefs (e.g., they feel they have enough experience to pass on knowledge or open their classroom to student teachers), intrinsic values (e.g., they enjoy passing on knowledge), social utility values (e.g., they want to help student teachers gain practical experience), intrinsic and extrinsic personal utility values (e.g., they value learning from students or getting paid to mentor), and social influence (e.g., they were asked by their school principal to become a mentor). These findings are discussed in light of EVT and FIT-Choice and function as starting point for a conceptual model addressing the initial motivation of becoming a mentor teacher.

Session U 8

26 August 2021 17:30 - 18:30

Session Room 17

Symposium

Instructional Design, Learning and Instructional Technology

The Role of Self-Generated Visualizations in Student Learning Performance

Keywords: Achievement, Comprehension of Text and Graphics, Mathematics, Motivation, Multimedia Learning, Quantitative Methods, Reasoning, Science Education, Teaching/Instruction, Values Education

Interest group: SIG 02 - Comprehension of Text and Graphics

Chairperson: Stanislaw Schukajlow, University of Münster, Germany

Organiser: Emmanuel Manalo, Kyoto University, Japan

Discussant: Peggy Van Meter, The Pennsylvania State University, United States

Self-generated visualizations, including diagrams and drawings, are considered to be facilitative of effective learning and performance. Various research paradigms such as the cognitive model of drawing construction (Van Meter & Firetto, 2013) and the generative drawing effect (Fiorella & Mayer, 2015) have been employed to investigate the roles of visualizations. However, prior findings about the role of self-generated visualizations in enhancing learning processes are mixed and indicate the need for further research. This symposium integrates contributions from different theoretical perspectives and research disciplines, including mathematics education and educational psychology. The symposium includes contributions from different domains: mathematics, science, and moral education. All contributions aimed at investigating higher-order learning and performance. The common feature between these contributions is taking into account indicators of the quality of the visualizations in the analysis of the learning processes. The contributions deal with students' motivation, quality of diagrams, performance in problem solving, critical thinking and reading comprehension, and include participants from school to higher education. We expect that combining perspectives from these fields will stimulate exchange across disciplines and contribute to research on visualizations. The symposium will include interactive elements (e.g., polls on the plausibility of the expected effects, collection of questions from participants via online chat). Fiorella, L., & Mayer, R. E. (2015). *Learning as a generative activity*. Cambridge University Press. Van Meter, P., & Firetto, C. M. (2013). Cognitive model of drawing construction. In G. Schraw, M. T. McCrudden, & D. Robinson (Eds.), *Learning through visual displays* (pp. 247–280). Information Age Publishing.

Can planning with diagrams help students think more critically about moral questions?

Presenting Author:Emmanuel Manalo, Kyoto University, Japan; **Co-Author:**Reena Cheruvath, Birla Institute of Technology and Science, Pilani Goa, India; **Co-Author:**Hiroaki Ayabe, National Institute for Physiological Sciences, Aichi, Japan

Although many previous studies have shown that the use of self-constructed diagrams is effective in learning-related tasks like problem solving and communication, fewer studies have examined their value in enhancing thinking performance. The few studies that have been conducted indicate effectiveness, but many questions remain unanswered, including the extent to which training may be necessary for effective use. In the present study, we investigated whether simply advising students to plan their answers to moral reasoning questions (that require critical thinking) – with or without the use of diagrams – might lead to improvement in those answers. In four groups that varied in instruction about plan to use (diagrammatic or non-specified) and advice on what to consider (provided or not), 136 undergraduate university students' answers to moral reasoning questions were evaluated before and after the requirement to plan. No consistent pre- and post-planning differences in various quality measures of answers were found, with the quality/usefulness of plans that students produced varying considerably, suggesting the need for instruction and/or guidance to maximize the benefits of such planning. Some differences, however, were found according to whether students used diagrams or not in planning. These suggest that planning with the use of diagrams is effective in facilitating deeper insight into the complexity of moral questions/issues being considered, as indicated by spontaneous inclusion of conditions (if ... then ...) in answers generated. Evidence was also found suggesting that use of visual and word connectors in planning was helpful in promoting some quality features in the answers.

Is Learning by Drawing Worth the Time and Effort?

Presenting Author:Qian Zhang, University of Georgia, United States; **Co-Author:**Logan Fiorella, University of Georgia, United States

Two experiments compared the effects of learning by drawing to studying instructor-provided visuals on learning outcomes, learning time, and cognitive load. College students studied a text on the human circulatory system and completed comprehension and transfer tests. In Experiment 1 ($N = 107$), students studied the text with provided visuals (provided visuals) or generated their own drawings from the text with text-based support (verbally supported drawing) or without support (unsupported drawing). Results showed that while the verbally supported drawing condition spent significantly more time and experienced significantly

higher cognitive load than the provided visuals condition, there were no differences across conditions in learning outcomes. In Experiment 2 ($N = 85$), students studied the text with provided visuals (provided visuals) or generated drawings from the text with provided visuals as feedback (visually supported drawing). Results showed that the visually supported drawing condition spent significantly more time and experienced significantly higher cognitive load than the provided visuals condition but outperformed the provided visuals condition on the comprehension test. These findings suggest that whether learning by drawing is worth the added time and effort compared to studying provided visuals depends on different types of drawing support.

Effects of strategy-based motivation on the quality of drawings and performance in mathematics

Presenting Author: Stanislaw Schukajlow, University of Münster, Germany; **Co-Author:** Johanna Rellensmann, University of Münster, Germany; **Co-Author:** Judith Blomberg, University of Münster, Germany; **Co-Author:** Claudia Leopold, University of Fribourg, Switzerland

This study investigated the role of strategy-based motivation (SBM) in solving real-world geometry problems. 473 lower-secondary-school students from 19 classes were assigned to either a strategy training or a control condition. Before the treatment, students were asked about their SBM. After the treatment, they were instructed to generate drawings and solve mathematical problems. The results revealed that self-efficacy expectations and perceived cost (but not value) regarding the drawing strategy affected the quality of students' drawings and performance in solving real-world problems. The effects of SBM on performance were mediated by the quality of learner-generated drawings. SBM did not moderate the effects of strategy training on drawing quality or performance. The results of our work are consistent with assumptions of the expectancy-value and learner-generated drawing theories about the influence of SBM on the quality of strategy use and performance. One important practical implication is that attention should be given to SBM in mathematics classes.

Session U 9

26 August 2021 17:30 - 18:30

Session Room 3

Symposium

Motivational, Social and Affective Processes

Leveraging SRL research into intelligent learning technologies

Keywords: Artificial Intelligence, Collaborative Learning, Emotion and Affect, Learning Analytics, Learning Technologies, Metacognition, Self-regulation

Interest group: SIG 16 - Metacognition

Chairperson: Sanna Järvelä, University of Oulu, Finland

Organiser: Sanna Järvelä, University of Oulu, Finland

Organiser: Inge Molenaar, Radboud University Nijmegen, Netherlands

Discussant: Arthur Graesser, University of Memphis, United States

There is much interest to advance digital technologies into intelligent technologies supporting teaching, learning and education. Yet, many initial ideas about artificial intelligence (AI) in education still lack systematic understanding of human learning and intelligence. In this symposium we leverage our long term self-regulated learning research to intelligent learning technologies in order to understand and support better learning. We discuss how progress in our multidisciplinary research implementing various multimodal data channels, advanced analytics and instructional design help us better understanding regulation of learning. All papers also consider the role of AI for understanding and supporting learning processes. Bannert et al. two empirical studies shed light on the measurement of SRL processes with multimodal data analyzed with machine learning facilitates our understanding of SRL. Lajoie et al. report how they have been using multimodal data to explore the complex relationship between emotions and self-regulated learning in medicine and the role of AI in both the design of technology and in assessing learning and emotions. Järvelä and Nguyen use large multimodal database for explore regulatory patterns and reveal trigger events in collaborative learning. Molenaar discusses how theoretical and empirical foundations from three studies are translated into the design of a Hybrid Human-AI Regulation system (HHAIR) that gradually transfer from AI-regulation to self-regulation. Our discussant Art Graesser will critically conclude and raise future issues needed to progress the research area.

Multimodal Data Analysis of Student's own Regulation Activities to Advance Personalized Scaffolds

Presenting Author: Maria Bannert, Technical University of Munich (TUM), Germany; **Co-Author:** Lyn Lim, Technical University of Munich, Germany; **Co-Author:** Joep van der Graaf, Radboud University Nijmegen, Netherlands; **Co-Author:** Yizhou Fan, The University of Edinburgh, United Kingdom; **Co-Author:** Jonathan Gilgour, The University of Edinburgh, United Kingdom; **Co-Author:** Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:** Johanna Moore, Monash University, Australia; **Co-Author:** Dragan Gasevic, Monash University, Australia

Education has been geared towards students' ability to regulate their own learning within technology-enhanced learning environments. Prior research has shown that self-regulated learning (SRL) leads to better learning performance but students often experience difficulties to adequately self-regulate their learning. They can be supported by instructional scaffolds which consequently improve learning outcomes. However, scaffolds are often standardized and not personalized. Learning analytics and machine learning offer an approach to better understand SRL-processes during learning. Yet, current approaches often lack validity or require extensive analysis after the learning process. Hence, in the interdisciplinary Flora project the combination of both research expertise in the fields of self-regulated learning and learning analytics provide superior opportunities to develop and test more effective adaptive learning technologies. The general aim of this research is to advance instructional support given to students by improving unobtrusive data collection and machine learning techniques to gain better measurement and understanding of SRL-processes. So far, two empirical studies (Study 1: $n=36$; Study 2: $n=46$ university students) about self-regulated learning in a digital learning environment were carried out and their main results will be discussed. Study 1 and 2 validate measurements of SRL combining multimodal data assessment and traditional think aloud measurements. This leads to improved measurements of SRL during learning and hence can be used to design personalized scaffolds based on individual SRL processes.

Uses and applications of AI to investigate Emotions and Self-Regulated Learning in Medicine

Presenting Author: Susanne Lajoie, McGill University, Canada; **Co-Author:** Shan Li, McGill University, Canada; **Co-Author:** Juan Zheng, McGill University, Canada; **Co-Author:** Alejandra Ruiz-Segura, McGill University, Canada

For the last several years we have been using multimodal data to explore the complex relationship between emotions and self-regulated learning in medicine. In particular, we have conducted a series of studies that make use of various combinations of multimodal data to test specific questions about learning diagnostic reasoning skills using BioWorld, a safe practice environment for students to diagnose virtual patient cases (Lajoie, 2009). This paper will provide an overview of specific hypotheses that we have explored using different types of data sets, along with our findings that advance our understanding of the role that emotions play in self-regulated learning in medicine. The role of AI in both the design of technology and in assessing learning and emotions will be discussed along with propositions for future steps in this area for developing "more intelligent" learning technologies that incorporate analyses of different types of evidence to make informed tutoring decisions.

Predicting regulatory patterns for socially shared regulation to optimize collaborative learning

Presenting Author: Sanna Järvelä, University of Oulu, Finland; **Co-Author:** Andy Nguyen, University of Oulu, Finland

We have been implementing multimodal methods to identify when, how, and what makes regulation in collaborative learning functional. A novel concept of trigger events will be introduced, which are those challenging events and/or situations that may inhibit collaboration and will, therefore, require strategic adaptation in the regulation of cognition, motivation, and emotion within the group. Trigger events are markers of metacognition, recognizing those challenging situations that require regulation because they inhibit collaborative learning (CL). We use a multimodal database involving video and electrodermal activities (EDA) data collected from secondary school ($N=94$) science lessons to explore regulatory patterns and reveal trigger events in CL. In particular, the study aligned Skin Conductance Response (SCR) with interactions for regulation to evidence trigger events and compare the physiological behavior among the different types of interactions. Furthermore, we conducted process mining on physiological arousals and regulatory interactions to predict patterns for socially shared regulation in collaborative learning. The results indicate the disparity of physiological behavior activated in relation to different types of interactions for

regulation and revealed the regulatory patterns in collaborative learning. Our findings provide evidence about the trigger events for regulation and indicate the potential use of multimodal data to detect regulatory triggers. Moreover, our progressing work can be used for developing real-time support for regulation in collaborative learning.

Towards Hybrid Human-AI Regulation: Supporting Young learners' Self-regulated Learning

Presenting Author:Inge Molenaar, Radboud University Nijmegen, Netherlands

Hybrid systems combining artificial and human intelligence hold great promise for training human skills. Hybrid Human-AI Regulation (HHAIR) is a novel way to develop learners' Self-Regulated Learning (SRL) skills within Adaptive Learning Technologies (ALTs). In this contribution, I discuss the theoretical and empirical foundations for such a system. HHAIR targets young learners (10-14 years) for whom SRL skills are critical in today's society. Many of these learners use ALTs to learn mathematics and languages every day in school. ALTs optimize learning based on learners' performance data but even the most sophisticated ALTs fail to support SRL. In fact, most ALTs take over (offload) control and monitoring from learners. Grounded in the COPES model of SRL and based on data of three empirical studies this contribution describes how HHAIR can resolve this issue. HHAIR is designed to gradually transfer regulation of learning from AI-regulation to self-regulation. Learners will increasingly regulate their own learning progressing through different degrees of hybrid regulation. In this way HHAIR aims to supports optimized learning (deep learning) and development of SRL skills for lifelong learning (future learning). This contribution outlines the theoretical and empirical foundations of the first hybrid systems to train human SRL skills with AI.

Session U 10

26 August 2021 17:30 - 18:30

Session Room 6

Symposium

Educational Policy and Systems

Grade retention effectiveness research in Europe: State of the art

Keywords: At-risk Students, Culture, Developmental Processes, Educational Policy, Quasi-experimental Research, Secondary Education

Interest group: SIG 18 - Educational Effectiveness and Improvement

Chairperson: Jannick Demanet, Ghent University, Belgium

Discussant: Mieke Goos, UCLL, Belgium

Research on the effectiveness of grade retention has a long history, going back to as early as 1908. Since 2000, many new, methodologically sophisticated studies have been conducted on this topic, in a variety of countries across the world. A recent meta-analysis of these studies has shown that grade retention has an overall zero effect, with effects, however, differing modestly across country types, retention applications, outcome domains, outcome timings, comparison approaches, and methods used. The same meta-analysis has also revealed that important gaps (still) exist in this research field, among which the overrepresentation of (a) US studies and (b) studies focusing on short-run effects. Our grade retention effectiveness symposium aims to address these gaps. First, our symposium brings together 4 studies from 4 countries outside the US, all in the OECD 'top 5' of grade retention prevalence. Second, our symposium brings together 4 studies focusing at outcome domains so far less examined, such as repeaters' civic attitudes. Our symposium closes with a discussion comparing the results and linking them to educational policy and practice.

Table 1 *Descriptive characteristics of the 4 symposium studies*
Study General information Method Country Data Research design Data analysis procedure
1 Portugal PTDC/CPECED/ 121358/2010 3-year longitudinal study, quasi-experimental design linear regression models
2 Germany NEPS-Starting-Cohort 3 4-year-longitudinal study, quasi-experimental design 2-level linear regression models
3 Luxembourg LUCET 7-year-longitudinal study, quasi-experimental design ANOVA
4 Belgium PISA-2018 cross-sectional study 3-level linear regression models

Effects of retention in grade 5-6 on Portuguese students' psychosocial development in middle school

Presenting Author:Joana Pipa, ISPA - Instituto Universitário / CIE-ISPA (Research Center in Education), Portugal; **Co-Author:**Francisco Peixoto, ISPA - Instituto Universitário / CIE - ISPA, Portugal; **Co-Author:**João Daniel, ISPA - Instituto Universitário, Portugal

Grade retention is a frequently used practice in education. In Portugal, grade retention is the most commonly applied measure to deal with students with low achievement and grade retention rates equal 25% by age 15. Grade retention has critical economic implications. Yet, previous research on grade retention effects is still producing controversial results, particularly regarding effects on students' psychosocial adjustment. This could be due, in part, to the outcomes considered, which could point to different directions depending on the specific outcome under investigation, or to the lack of high-quality methods employed to estimate causal effects. Our study aims to analyse the effects of retention in grades 5 and 6 on students' developmental trajectories in academic self-concept, self-esteem, and goal orientations during middle school. The analytic sample consisted of 61 students retained in 5th or 6th grade and 70 promoted students matched in several pre-retention covariates. Students completed the Self-concept and Self-esteem Scale and the Goal Orientations Scale, every year, for three years, starting when they were in 5th grade for the first time. Overall, the results showed more negative trajectories in self-concept in language, self-esteem, and task goal orientations among repeaters, suggesting that retained students would have fared better in those components, had they been promoted instead of been held back.

Effects of retention in grade 7 on multiple socioemotional outcomes among German repeaters

Presenting Author:Paul Fabian, CENTER FOR RESEARCH ON EDUCATION AND SCHOOL DEVELOPMENT, Germany; **Co-Author:**Katja Scharenberg, University of Education Freiburg, Germany

Grade retention is a policy widely accepted by politicians, teachers, parents, and students in Germany, with retention rates equalling as much as 18.78% by age 15. A large body of international research on grade retention effectiveness exists. Yet, there is a lack of research for the German context. More specifically, most of the recent German grade retention studies focus on math-related socio-emotional outcomes. The aim of this study is to investigate effects of retention in grade 7 on other socioemotional outcomes, such as reading-related socio-emotional outcomes (self-concept, motivation), school satisfaction, and feelings of helplessness, in grades 8 and 9. We used a subsample of a big, German, longitudinal database (NEPS, Starting-Cohort-3). Propensity score matching and two-level linear regression analyses were used to examine effects. Overall, our first findings showed no significant differences between repeaters and same-age matched non-repeaters regarding reading self-concept and reading motivation, which seems to indicate that grade 7 repeaters would have fared equally in terms of self-concept and motivation in reading in grade 8 and 9 if promoted instead of been held back. At the EARLI conference, we will discuss the possibility of analysing effects on other outcomes (e.g., changes in aspirations or changes in relations to significant others).

Long-term effects of retention in grade 8 in Luxembourg

Presenting Author:Florian Klapproth, Medical School Berlin, Germany; **Co-Author:**Ulrich Keller, University of Luxembourg, Luxembourg; **Co-Author:**Antoine Fischbach, Luxembourg Centre for Educational Testing, Luxembourg

Meta-analyses have suggested that grade retention rarely has positive effects and more often negative effects on students' performance and psycho-emotional well-being. The occurrence of negative effects may be due to the absence of new learning experiences. However, in the short term, positive effects of grade retention are quite likely to occur. In Luxembourg, more than half of the students repeat at least one grade within their entire school career. Since grade retention is applied quite frequently, the aim of the current study was to examine long-term effects of grade retention. A representative sample of 2,835

Luxembourgish 8th grade students was used for this study, and propensity score matching was applied to select a control group of promoted students who were similar to the retained students on a variety of characteristics. Furthermore, a type of comparison was used by which the outcome variables of the retained and promoted students were compared at different times while the grade- and age-cohort were held equal between groups. With respect to school marks as an indicator of students' academic achievement, this study showed that grade 8 retention lowered repeaters' school marks, on average, in grades 10 to 13, as compared to matched non-repeaters.

Does retention in grades 1-9 produce cynical citizens? A cross-national multilevel analysis

Presenting Author:Timo Van Canegem, Ghent University (Department of Sociology), Belgium; **Co-Author:**Mieke Van Houtte, UGENT, Belgium; **Co-Author:**Jannick Demanet, UGENT, Belgium

This study assesses the association between grade retention and civic attitudes among adolescents. School curricula often stress creating a sense of community among students, since this is believed to be a backbone of democratic societies. At the same time, schools use grade retention as a differentiation mechanism in order to sort students based on their perceived capacities. As such, there appears to exist a tension between actively promoting social cohesion and giving certain groups of students a fundamentally different treatment. Therefore, retainees can be expected to hold more cynical civic attitudes. Furthermore, based on reference group theory, contextual effects on both the school level and the national level can be expected. In particular, we expect retainees to be more cynical in contexts with less retainees, because they are more at risk of being stigmatized or isolated. Moreover, we expect both retainees and promoted students to be more cynical in environments with a high amount of retainees, because of a spill-over effect in which cynical retainees increase the cynicism of non-retainees. Cross-national multilevel analyses on the PISA-2018 data set were conducted in order to test these hypotheses. Results confirm that retainees have a more cynical world view. As expected, this cynicism increases when retainees are surrounded by a low amount of other retainees on both the school level and educational system level. Unexpectedly, however, there seems to be no spill-over effect from retainees to non-retainees, since students in schools with a high retention composition have a significantly less cynical world view.

Session U 11

26 August 2021 17:30 - 18:30

Session Room 14

Symposium

Learning and Instructional Technology

Using educational technology to scaffold students' academic writing

Keywords: Assessment Methods and Tools, Computer-assisted Learning, Educational Technology, Learning Technologies, Writing/Literacy

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Andreas Lachner, University of Tübingen, Germany

Organiser: Salome Wagner, University of Tübingen, Germany

Discussant: Rod Roscoe, Arizona State University, United States

Supporting students' writing development is regarded as a critical aspect in writing instruction. In this context, computer-based feedback (CBF) is seen as beneficial supplement of instructor feedback, which may be suited particularly in self-regulated individualized writing phases. Although there is a rising interest in CBF-technologies, the empirical basis when and why CBF is effective is scarce. The aim of the current symposium is to bundle empirical investigations and research reviews to portray a coherent picture of the potential effects of CBF-systems. Contribution 1 represents a systematic literature review to provide an overview of the landscape of available research-based CBF-tools. Contribution 2 is also a systematic review, in which the authors more directly investigated the potential benefits of Automated Writing Evaluation (AWE), one specific CBF, in the context of K-12 education. As these two contributions particularly focus on product-oriented feedback systems, Contribution 3 provides findings of an empirical evaluation study, in which the effectiveness of an innovative CBF-system, which provides feedback on the writing process by key-stroke analysis, is evaluated. Together, the findings provide a coherent set of studies to provide recommendations for researchers and practitioners on how to utilize CBF to attain students' writing development.

Where to Next? Mapping the Landscape of Research on Computer-Based Feedback on Writing

Presenting Author:Salome Wagner, University of Tübingen, Germany; **Co-Author:**Jürgen Schneider, University of Tübingen, Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany

Technology enthusiasts often regard computer-based feedback (CBF) as a feasible tool to provide students with individualized and immediate feedback. Given that there is a plethora of CBF-systems, which radically differ regarding the quality of feedback information, as well as the feedback presentation, CBF is often discussed controversially. To map the current research landscape, we conducted a systematic literature review ($n = 44$) on the available CBF-systems. Particularly, we focused on the type of feedback information and the utilized feedback representation to cluster the different CBF-systems. We found that most CBF-systems combine different types of lower-order (e.g., grammar, spelling) and higher-order feedback (e.g., cohesion, organization), as well as different types of representations. Until the EARIL 2021, we will also provide meta-analytical data to examine the effectiveness of CBF-systems. As such, our findings contribute to a better understanding of the boundary conditions of computer-based feedback, and guide ways to optimize feedback to support students' academic writing.

Automated Writing Evaluation System and its Effects on Students' Writing: A Systematic Review

Presenting Author:Andreia Nunes, University of Porto, Portugal; **Co-Author:**Teresa Limpio, University of Porto, Portugal; **Co-Author:**São Luís Castro, University of Porto, Portugal

Despite the fundamental value that the expertise in writing brings to personal development, achieving proficiency in writing is a hard task for many Grades 1-12 students. These difficulties bring additional challenges to the process of teaching. In the digital age, the use of technology to support instruction in writing holds a great potential. Automated Writing Evaluation (AWE) systems can help teachers to assess students' writing in a timely and cost-effective way. However, little is known about the effects of these systems on writing quality of Grades 1-12 students. Thus, we aimed to develop a systematic review focusing on the effect of the use of AWE systems on writing quality of Grades 1-12 students. After applying inclusion and exclusion criteria, we selected 6 studies for analysis. The six studies were coded in three categories: studies' descriptions, AWE systems, and the effectiveness of the AWE systems. Preliminary results showed that the majority of studies followed a quasi-experimental design, were conducted in the US, and targeted middle grades. The AWE systems used were NC Write, Writing Roadmap, EssayCritic, ETS Criterion, and Summary Street. Excepting one study, findings showed that the feedback provided by different AWE systems had a positive impact on different measures of writing. Moreover, teachers and students recognized the positive impact of the systems in the teaching and learning process. We believe findings will expand knowledge about the use of AWE systems, and its effectiveness for students in Grades 1-12.

Writing process feedback based on keystroke logging data and exemplars

Presenting Author:Nina Vandermeulen, Umeå University, Sweden; **Co-Author:**Elke Van Steendam, University of Leuven, Belgium; **Co-Author:**Gert Rijlaarsdam, University of Amsterdam, Netherlands

Feedback plays an important role in acquiring a highly complex skill such as writing. Currently, feedback aiming to improve the writing process is scarce. In practice, teachers usually give feedback on the writing product. However, given that it is the writing process that generates the product, feedback on the writing process is valuable and should be taken into account as well. We conducted an intervention study with 67 grade 10 students to explore the effects of two types of process-oriented feedback on students' source-based writing. Participants received a customized process report generated with keystroke logging tool Inputlog, providing them with numerical and visual information on several aspects of their writing process. The process report was embedded into a feedback flow in which students were encouraged to reflect on their writing and to compare it to exemplary benchmark writing processes. These benchmark processes were selected from a national baseline study with more than 700 students. In the position-setting feedback condition, students compared their writing process to examples of equally-scoring students. The students in the feed-forward feedback condition, compared their writing process to the process of higher-scoring students. In our presentation, we will present the design of the process feedback, results regarding the feedback effect on product and process measures, and students' perception of the feedback. Results showed that the feed-forward feedback had a positive effect on the quality of the texts. Students in this condition adopted a more goal-oriented reading-writing strategy.

Session U 12

26 August 2021 17:30 - 18:30

Session Room 12

Symposium

Motivational, Social and Affective Processes

Experience sampling and the dynamics of students' motivation and engagement.

Keywords: Achievement, Developmental Processes, Emotion and Affect, Higher Education, Motivation, Motivation and Emotion, Quantitative Methods, Secondary Education, Self-efficacy

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Hanke Kopershoek, University of Groningen, Netherlands

Organiser: Elisa Kupers, University of Groningen, Netherlands

Discussant: Mayra Mascareño Lara, University of Groningen, Netherlands

What is the nature of motivation and engagement and how can it best be measured? Students' motivation is likely to fluctuate from lesson to lesson. However, the main body of research on motivation and engagement relies on associations at a group level, with one or at most a handful of measurement points. This is problematic because relations between variables at the group level might be very different from relations at the individual level. This is known as the 'ergodicity problem' (Molenaar, 2004). The rise of experience sampling in educational research opens up possibilities to gather dense intra-individual data. Contributions to this symposium highlight some of the most state-of-the-art developments in this field. By gathering data from lesson to lesson, it is possible to zoom in on the nature of micro-level and long term dynamics of engagement and motivation, as well as on situational triggers either enhance or detract students' motivation and engagement in the classroom. The first presentation of Jarvinen et al. focuses on patterns in engagement and disaffection, linked to perceived task progress and challenge. In the second presentation, Loopers et al. focus on the role of special educational needs in the development of motivation and basic psychological needs over the course of a school year. Kupers et al. focus on the lesson-to-lesson links between teacher self-efficacy and student motivation, whereas Bieg and Nett relate university students' emotional engagement to the perceived enthusiasm and humor of their teacher in the final presentation.

Momentary engagement profiles among upper secondary school students

Presenting Author:Jussi Järvinen, University of Helsinki, Finland; **Co-Author:**Elina E. Ketonen, University of Helsinki, Finland; **Co-Author:**Lauri Hietajärvi, University of Helsinki, Finland; **Co-Author:**Katriina Salmela-Aro, Helsinki University, Finland

The present study examined students' engagement and disengagement during academic tasks and situations. We used person- and situation-oriented approach to identify different ways students (dis)engage in the moment. Further, we examined whether there are between-student differences in these engagement moments. Finally, we investigated how these engagement moments and student profiles were associated with task progress and academic performance. The participants were 130 students who reported their *in situ* experiences (N = 1392) six times a day during a 10-day period with experience sampling questionnaires. Based on multilevel latent profile analyses we identified six types of engagement and disengagement moments: high engagement (20%), moderate engagement (20%), indifferent engagement (11%), anxious engagement (13%), anxious disengagement (14%), and bored disengagement (10%). Additionally, we identified six student profiles that differed in how frequently they experienced these moments: highly engaged (28%), moderately engaged (35%), indifferently engaged (18%), and anxious (18%) students. The engagement moments were further related to perceived progress but there were no differences between the student profiles in academic performance. These findings indicate that students experience qualitatively different types of momentary engagement and disengagement, and these experiences may include elements of both. Moreover, these engagement types can vary from moment to moment, even within same students. Still, there are differences between students in how much they experience each of these engagement moments. Engagement and disengagement seem to be related to progress in momentary level but their associations with longer-term performance is not clear.

Differential Trajectories of Intrinsic Motivation and Basic Psychological Need Satisfaction

Presenting Author:Judith Loopers, University of Groningen, Netherlands; **Co-Author:**Elisa Kupers, University of Groningen, Netherlands; **Co-Author:**Anke de Boer, University of Groningen, Netherlands; **Co-Author:**Alexander Minnaert, University of Groningen, Netherlands

To gain insight in the declining motivational trend towards adolescence, this research takes a person-oriented approach towards the development of motivation in adolescence by analyzing differential trajectories of intrinsic motivation and basic psychological need satisfaction. These trajectories are not only based on mean levels and slope, but also on intraindividual variability, as the latter is an important characteristic of development. By focusing on students with special educational needs (SEN), it is explored where individual differences in motivational trajectories possibly come from. To capture these intraindividual dynamics, we use the experience sampling method. Students (8th grade, N = 146) completed questionnaires for approximately 20 weeks. Three trajectories of intrinsic motivation as well as of need satisfaction are found. Mean levels and intraindividual variability are the main distinctive characteristics of the trajectories. Students with SEN are not significantly overrepresented in one of the clusters, but are highly represented in the group of irregularly low satisfied students, showing the lowest, most declining and instable need satisfaction. Therefore, students with SEN may need special attention. However, they seem to be a very heterogeneous group, being present in all trajectories. This research emphasizes the importance of focusing at the level of the individual student, as subgroups of students showed problematic trajectories of intrinsic motivation and need satisfaction. Besides, it shows that variability is an important factor to consider, as it is associated with lower levels of motivation and need satisfaction.

Lesson-to-lesson links between teacher self-efficacy need-supportive teaching and student motivation

Presenting Author:Elisa Kupers, University of Groningen, Netherlands; **Co-Author:**Judith Loopers, University of Groningen, Netherlands; **Co-Author:**Anke de Boer, University of Groningen, Netherlands; **Co-Author:**Alianne Bakker, University of Groningen, Netherlands; **Co-Author:**Alexander Minnaert, University of Groningen, Netherlands

Why are some teachers more successful in fostering student engagement and motivation than others? An abundance of literature has shown that need-supportive teaching (providing autonomy support, structure and showing involvement in interactions with students) has relations with student experienced motivation and engagement (Stroet, Opdenakker & Minnaert, 2013). In turn, teacher-self-efficacy predicts supportive teaching behaviors, including need-supportive teaching (Zee et al. 2016 review). Teacher self-efficacy (TSE) has been shown to apply to different domains, and the level of self-efficacy can vary when it comes to different students (Zee, De Jong, & Koomen, 2017). However, despite of its apparent complex and dynamic nature, TSE is almost always measured at only one point in time. In this study, we therefore zoom in on lesson-to-lesson variation in self-efficacy, need-supportive teaching and student motivation. We followed 11 teachers and their 231 students in lower vocational education for 20 weeks by means of experience sampling with the U-can-Act app (Blaauw et al., 2019). Immediately after 2-3 lessons every week, teachers rated their sense of self-efficacy and need-supportive teaching in that lesson, while students rated their level of motivation. Preliminary results show a large degree of both intra- and interindividual variation in TSE between and within teachers. The links between these variables are further tested by means of VAR (vector autoregression) modeling.

Student-perceived teachers' enthusiasm and humor related to students' enjoyment and boredom

Presenting Author:Sonja Bieg, Paedagogische Hochschule Weingarten, Germany; **Co-Author:**Ulrike Nett, Augsburg University, Germany

Students' experienced emotions in learning situations play an essential role for their achievement and well-being. This study focuses on students' appraisals of instruction as a facet of the social environment in relation to students' emotions. According to Pekrun's (2006) control-value theory of achievement emotions, we investigated the carry-over effects and cross-lagged relationships between student-perceived teachers' enthusiasm and humor and students' enjoyment and boredom within and between university lectures. We used a latent state-trait approach to acknowledge the role of situational factors in this relationship. The data were collected from 559 university students from five different lecture courses (76% female, MAge = 21.6 years, 69% teacher students). We assessed students' self-reported enjoyment and boredom and student-perceived teacher enthusiasm and content-related humor over a period of four lectures at three random points during each lecture. The analyses revealed carry-over effects within lectures for all variables but between lectures only for enjoyment and humor. There were negative cross-lagged effects of students' boredom on student-perceived teacher enthusiasm and humor and a cross-lagged effect of student-perceived

teacher humor on students' enjoyment within lectures. These results provide insight into the differential relations of students' emotions with student-perceived teacher instructional behavior. The role of instructional behavior for fostering students' emotion is discussed.

Session U 13

26 August 2021 17:30 - 18:30

Session Room 11

Invited Symposium

EFG: Educational neuroscience: a journey from the lab to the real-world, and back...

Keywords: Attitudes and Beliefs, Cognitive Skills, Experimental Studies, Neuroscience, Peer Interaction, Self-regulation, Technology

Interest group: SIG 22 - Neuroscience and Education

Chairperson: Tieme Janssen, Vrije Universiteit Amsterdam, Netherlands

Discussant: Ido Davidesco, University of Connecticut, United States

As the field of educational neuroscience has grown, questions have emerged regarding the ecological validity and applicability of lab-based research to educational practice. Recent developments in mobile neuroimaging technology (EEG, fNIRS) may offer a solution by bringing the lab to real-world learning settings. However, this comes at the cost of lower experimental control. A cyclic research model, which involves iterating between lab-based, semi-naturalistic, and fully-naturalistic neuroscience, is well suited for bringing these various approaches together. Research at all stages of the cycle is important; lab research is needed to provide a basis for naturalistic research to build on, while the latter is needed to test the generalizability of lab findings, or for formulating new hypotheses that can be tested in more controlled environments. In this symposium, three speakers will share their research conducted with mobile EEG/fNIRS. We aim to provide convincing examples of how research can dynamically move back and forth between more controlled and more naturalistic settings. Each speaker will not only discuss the valuable insights that can be gained from mobile EEG/fNIRS, but also the challenges posed by bringing neuroscientific methods into real-life settings. We conclude with a panel discussion on the trade-offs between experimental control and ecological validity, and on the ethical considerations that should be taken into account in this unique area of research.

Opportunities and limitations of mobile neuroimaging technologies in educational neuroscience

Presenting Author: Tieme Janssen, Vrije Universiteit Amsterdam, Netherlands

As the field of educational neuroscience continues to grow, questions have emerged regarding the ecological validity and applicability of this research to educational practice. Recent advances in mobile neuroimaging technologies have made it possible to conduct neuroscientific studies directly in naturalistic learning environments. We propose that embedding mobile neuroimaging research in a cycle (Matusz et al., 2019), involving lab-based, semi-naturalistic and fully-naturalistic experiments, is well suited for addressing educational questions. With this review we take a cautious approach, by discussing the valuable insights that can be gained from mobile neuroimaging technology, including EEG and fNIRS, as well as the challenges posed by bringing neuroscientific methods into the classroom. Research paradigms used alongside mobile neuroimaging technology vary considerably. To illustrate this point, studies are discussed with increasingly naturalistic designs. We conclude with several ethical considerations that should be taken into account in this unique area of research.

Cycling to and fro: Using mobile EEG to study cognition and brain activity during biking

Presenting Author: Kyle Mathewson, University of Alberta, Canada

Here we show how cognitive neuroscience research can make a graceful transition outside of the traditional confines of the lab. We start with the behaviour of bike riding to study cognition in the real world. Across studies, we use the same concurrent auditory oddball task with identical parameters, allowing us to compare how different settings and activities influence behaviour and brain activity and task performance. We find that biking itself does not influence traditional auditory evoked potential, but that biking outside in a noisy world does. We test this idea by replicating environmental auditory noise in the lab and confirm our theory, and show how this paradigm can be used in collaboration with industry to test for impact of our built urban environment on our cognition. By using a dual task paradigm, and repeating the same task across studies, we retain a degree of control needed to integrate results over studies and understand how the varied behaviours we engage in throughout our day can influence cognitive processing and associated neural activity.

Engineering light to monitor brain oxygenation and hemodynamics in naturalistic environments

Presenting Author: Paola Pinti, Birkbeck College, University of London, United Kingdom

The assessment of functional brain activity in everyday life situations represents the new frontier for cognitive neuroscience investigations. Thanks to the recent technological advancements in neuroimaging instrumentation, we have now available new mobile and wearable functional Near Infrared Spectroscopy (fNIRS) devices that allow to image functional brain activity in more ecologically-valid situations such as outside the lab and on freely-moving people. However, the use of fNIRS in more naturalistic contexts presents several challenges, including the design of appropriate functional activation protocols, the technology limitations, the localization and inference of functional brain activity, and the impact of systemic physiological changes. In addition, in case of unstructured cognitive tasks, the identification of functional events in real-world experiments can be inaccurate. In this talk, I will give an overview of pilot studies using fNIRS to monitor brain hemodynamics and oxygenation on people freely-moving outside the lab. In particular, I will discuss the technical challenges associated with real-world neuroimaging and suggest possible solutions to overcome them. Finally, potential areas of applications that would benefit from wearable neuroimaging systems will be discussed.

Session U 14

26 August 2021 17:30 - 18:30

Session Room 10

Collaborative Workspace

Higher Education

Intercultural collaboration for HE students: current and possible research directions

Keywords: Cooperative/Collaborative Learning, Culture, Higher Education, Multicultural Education

Interest group: SIG 21 - Learning and Teaching in Culturally Diverse Settings

In an increasingly globalized world, an international and intercultural learning environment is becoming a reality for many higher education students and teachers. In the process of internationalizing higher education, universities aim to create effective and inclusive learning environments for both home and international students. Intercultural group work (IGW), in which home and international students collaborate on set tasks or projects, is considered a valuable learning tool to deepen students' learning and prepare students for participating in a globalized world. However, the presence of multiple cultures does not automatically lead to meaningful collaboration. Therefore, to benefit from a culturally diverse learning environment, more research is needed into different aspects of intercultural collaboration between students. This session aims to create a network of researchers in the area of intercultural group work in higher education to share research ideas, benefit from each other's expertise, strengthen each other's research, and explore possible collaborations. We will discuss the following questions: *What* - An inventory of current research projects on intercultural group work (or that are planned for the near future)*How* - Which methodologies are used? Are there particular challenges in methodologies specifically relating to the intercultural setting? *What's next* - Which aspects of intercultural group work are underexplored? What are the research gaps? Are there possibilities for future collaboration? *Participants are invited to prepare a slide of their own work to share at the session to illustrate their work in this area.*

Intercultural collaboration for HE students: current and possible research directions

Presenting Author: Becky Bergman, Chalmers University of Technology, Sweden; **Presenting Author:** Irene Poort, University of Groningen, Netherlands;

Presenting Author:Kirsten Davis, Purdue University, United States

In an increasingly globalized world, an international and intercultural learning environment is becoming a reality for many higher education students and teachers. In the process of internationalizing higher education, universities aim to create effective and inclusive learning environments for both home and international students. Intercultural group work (IGW), in which home and international students collaborate on set tasks or projects, is considered a valuable learning tool to deepen students' learning and prepare students for participating in a globalized world. However, the presence of multiple cultures does not automatically lead to meaningful collaboration. Therefore, to benefit from a culturally diverse learning environment, more research is needed into different aspects of intercultural collaboration between students. This session aims to create a network of researchers in the area of intercultural group work in higher education to share research ideas, benefit from each other's expertise, strengthen each other's research, and explore possible collaborations. We will discuss the following questions: *What* - An inventory of current research projects on intercultural group work (or that are planned for the near future) *How* - Which methodologies are used? Are there particular challenges in methodologies specifically relating to the intercultural setting? *What's next* – Which aspects of intercultural group work are underexplored? What are the research gaps? Are there possibilities for future collaboration? *Participants are invited to prepare a slide of their own work to share at the session to illustrate their work in this area.*

Session V 1

26 August 2021 18:45 - 19:45

Session Room 13

Single Paper

Higher Education, Instructional Design, Teaching and Teacher Education

Workplace Learning**Keywords:** Communities of Practice, Competencies, Design-based Research, Teacher Professional Development, Vocational Education, Workplace Learning**Interest group:** SIG 04 - Higher Education, SIG 06 - Instructional Design, SIG 11 - Teaching and Teacher Education**Chairperson:** Inge Van der weijden, Leiden University, Netherlands**Work-Oriented Project Learning in Vocational Education****Keywords:** Communities of Practice, Design-based Research, Vocational Education, Workplace Learning**Presenting Author:**Marjaana Kangas, University of Lapland, Finland; **Co-Author:**Solja Upola, Lapland Education Centre Redu, Finland

The objective of the research was to explore and develop work-based learning practices in Finnish vocational education. The ultimate goal was to develop a pedagogical model for Work-Oriented Project Learning (WOPL) to support cooperation between vocational education and training (VET) institutions and the industrial sector and to enhance students' learning and working life competences. The research questions addressed are: 1) What kind of pedagogy can best support work-oriented project learning? and 2) What factors underlie the attributes of the project actors in work-oriented project learning? The design-based study was carried out during the years 2008–2017. The qualitative research data were gathered from all three project actors: students (N=143), vocational teachers (N=46) and representatives of working life (N=17). The data were analysed in iterative cycles. The results show that the pedagogical model for WOPL is multilayered, flexible and socially constructed and reconstructed. It describes a variety of features of learning processes and consists of reciprocal interactions and interrelationships between project actors.

Competence development of a student teacher already working as a teacher**Keywords:** Competencies, Teacher Professional Development, Vocational Education, Workplace Learning**Presenting Author:**Jiri Vilppola, Tampere University of Applied Sciences, Finland; **Co-Author:**Raija Hämäläinen, University of Jyväskylä, Finland; **Co-Author:**Katja Vähä santanen, University of Jyväskylä, Finland; **Co-Author:**Petri Salo, University of Vaasa, Finland

The concepts of competence and competence-based education in vocational education and training (VET) and higher education have been central topics of discussion at both global and national levels. This study aimed to investigate the kinds of competencies developed during competence-based education and work-life oriented VET teacher training in Finland. The supportive and challenging factors for competence development in this kind of training model were also studied. All participants ($n = 14$) were already working as non-qualified teachers. The data, which consisted of learning diaries and graduation narratives from 2018–2019, were analysed with a qualitative content analysis. The results showed that the most developed competencies were pedagogical method understanding and implementation as well as conceptual and reflective thinking. In addition, student-centred and guidance competencies were gained. These competencies were mainly achieved by integrating VET teacher training competence frameworks into an individual's everyday work. The biggest challenges for participants were work overload, constantly being busy at work, and organizational changes. The most supportive factor of competence development was a mentor, a colleague nominated from the student teacher's workplace. The study suggests that a competence-based and work-life oriented educational model can be a valid way to gain vocational education and training teacher competencies. However, workplace-related challenges require proactive actions and practices. Also, the role of deeper knowledge about teachers' future work life and its dynamic demands needs further attention. This research was peer-reviewed and published in Finnish in the *Journal of Professional and Vocational Education* 2020.

Shaping the futures of higher education through international academic networks**Keywords:** Communities of Practice, Competencies, Teacher Professional Development, Workplace Learning**Presenting Author:**Mònica Feixas, Zurich University of Teacher Education, Switzerland; **Co-Author:**Barbara Class, University of Geneva, Switzerland; **Co-Author:**Samir Boulos, Zurich University of Teacher Education, Switzerland

Interest for professional development of teacher educators in international settings is increasing but research in joint global initiatives is still nascent. We present the outcomes of a study whose aim is to examine the exchange processes and dynamics taking place among academics of teacher education in two five-year Swiss funded networked projects. It contributes to a more elaborate understanding of what appears as a mere exchange of pedagogical knowledge among peers, that is the transcultural qualities and learning processes inherent in the interactions within these social spaces. We use methods of qualitative research to get a rich and deep insight into the phenomena from the perspectives of the participants: forty-eight university teacher educators (24 for each network) originating from 5 different countries and with an average of 10 years of teaching experience. Data gathered consist of a) documents produced during the meetings, b) analogue observations of two trios work, c) teaching philosophies and d) reflections of ad hoc online focus groups with academics from both networks. A content thematic analysis (Krippendorf, 2004) of the data was performed. The two international academic networks are offering an enormous opportunity for teacher development. While there are many gains including transcultural learning, enhanced professionalization and intercultural competencies, there are also challenging aspects to networking which have to be addressed, including language barriers and fear of exclusion. Questions arise about promoting Open Education: giving access and helping circulate knowledge equitably, epistemic justice and creating joint curricula in the global academy.

Session V 2

26 August 2021 18:45 - 19:45

Session Room 17

Single Paper

Learning and Instructional Technology, Motivational, Social and Affective Processes

Educational Technology in Mathematics and Numeracy**Keywords:** Early Childhood Education, Educational Technology, Game-based Learning, Mathematics, Motivation and Emotion, Numeracy, Student Learning**Interest group:** SIG 08 - Motivation and Emotion, SIG 27 - Online Measures of Learning Processes

Chairperson: Crina Damsa, University of Oslo, Norway

Examining the development of adaptive number knowledge through game performance measures

Keywords: Educational Technology, Game-based Learning, Mathematics, Student Learning

Presenting Author: Jake McMullen, University of Turku, Finland; **Co-Author:** Boglárka Boglárka, University of Turku, Hungary; **Co-Author:** Minna M Hannula-Sormunen, University of Turku, Finland; **Co-Author:** Erno Lehtinen, University of Turku, Finland

Adaptive number knowledge (ANK) is a quality of adaptive expertise in arithmetic, which reflects a well-connected network of numerical characteristics and arithmetic relations. The Number Navigation Game (NNG) is a game-based learning environment that aims to promote flexibility and adaptivity with arithmetic problem-solving. In a large-scale randomized control trial, NNG was effective in promoting ANK, particularly among fifth-grade students (Brezovszky et al., 2019). The present study aims to use process data and growth curve modeling to further examine the role of game performance in the development of ANK and other arithmetic skills and knowledge. Prior ANK predicted the development of game performance. As well, even after accounting for pre-test levels, improvements in game performance positively predict post-test ANK. These results suggest that improvements in game performance led to better learning gains in ANK. Implications for game design and methodological approaches to measuring students learning within game-based environments are considered.

The Role of the Situational Interest in Game-Based Learning

Keywords: Educational Technology, Game-based Learning, Mathematics, Motivation and Emotion

Presenting Author: Antti Koskinen, University of Tampere, Finland, Finland; **Co-Author:** Jake McMullen, University of Turku, Finland; **Co-Author:** Hilma Halme, University of Turku, Finland; **Co-Author:** Kristian Kili, Tampere University, Finland

The main aim of this study was to clarify the role of situational interest in game-based learning. We investigated how students' self-efficacy and individual math interest are associated with their situational interest in a game-based learning environment. Moreover, we investigated how situational interest was associated with knowledge acquisition. Situational interest and self-efficacy were measured in-game during an intervention where students' (N=98) trained their rational number knowledge with the Number Trace math game for three 45 minutes lessons. Using a path model, we show students' math interest and self-efficacy were positively associated with their situational interest and their situational interest was positively associated with their knowledge acquisition. These results are in line with the results of the previous interest studies conducted in other learning contexts. The results of this study emphasize the need for integrating situational interest measurements in the game-based learning environments to advance our knowledge of how students' emotional and cognitive processes are integrated.

Effectiveness of an adaptive digital game for the training of early numerical abilities

Keywords: Early Childhood Education, Educational Technology, Game-based Learning, Numeracy

Presenting Author: Stefanie Vanbecelaere, KU Leuven, Belgium; **Co-Author:** Frederik Cornillie, KU LEUVEN, Belgium; **Co-Author:** Bert Reyvoet, KU LEUVEN, Belgium; **Co-Author:** Delphine Sasanguie, KU Leuven, Centre for Instructional Psychology and -Technology (Vesaliusstraat 2, 3000 Leuven), Belgium; **Co-Author:** Fien Depaepe, KU Leuven, Belgium

Adaptive educational games provide new opportunities to train early numerical skills. However, empirical evidence for the effectiveness of adaptive educational games is scarce. This study investigated the effectiveness of an adaptive game compared to a nonadaptive game in terms of cognitive, noncognitive and efficiency outcomes. In total, 84 children were randomly assigned to a condition in which children trained early numerical skills with an adaptive version of the Number Sense Game (NSG), or to a condition in which they trained with a nonadaptive version. Early numeracy was evaluated before the training, immediately after the training and 3 weeks after the training. Math anxiety (MA) was assessed before and 3 weeks after the training. The time children practiced with the NSG was used to assess efficiency. Results revealed that children in both conditions improved on early numerical ability, with sustained effects 3 weeks after the training. In both conditions, children's MA scores were lower after the training. Children in the adaptive condition learned more efficiently compared to the nonadaptive condition, and the interaction between prior knowledge and condition has shown that children with low prior knowledge benefited more from a nonadaptive training while children with high prior knowledge benefited more from an adaptive training in terms of learning efficiency. These results confirm that adaptive educational games can offer solace in terms of the need for differentiation.

Session V 3

26 August 2021 18:45 - 19:45

Session Room 3

Single Paper

Assessment and Evaluation, Learning and Social Interaction

Assessment Methods and Tools in Mathematics

Keywords: Achievement, Assessment Methods and Tools, Competencies, Higher Education, Mathematics, Problem Solving, Secondary Education, Self-efficacy, Social Sciences

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Ari Tuhkala, University of Jyväskylä, Finland

Construction and validation of a test to measure students' proportional reasoning in Mathematics

Keywords: Assessment Methods and Tools, Competencies, Mathematics, Secondary Education

Presenting Author: Ruth Wafubwa, University of Szeged, Kenya

This study aimed to develop and validate a proportional reasoning test (PRT) to measure students' proportional reasoning skills on rates, ratios, and proportions in mathematics. The test items were carefully designed to reflect the aspects of proportional reasoning identified in the existing literature and aligned them to the instructional objectives as stated in the Kenya secondary mathematics curriculum. The test underwent different developmental processes to establish content-related validity before it was piloted. The pilot was conducted on a sample of 45 form three students from one school in Kenya. The results showed an acceptable internal consistency level (Cronbach's $\alpha = .83$). The item analysis revealed that all the items had a moderate difficulty level ranging from .39 to .50. The discrimination index for most items ranged from .22 to .44. The findings suggest that the PRT is a valid and reliable instrument that can be used to measure the domain-specific skills on proportional reasoning. More specifically, the instrument can be used to measure the impact of a formative assessment intervention on students' achievement on proportional reasoning skills.

Validity of a mathematics test for the selection of university applicants for teacher training

Keywords: Assessment Methods and Tools, Competencies, Mathematics, Self-efficacy

Presenting Author: Robin Göller, Leuphana University Lueneburg, Germany; **Presenting Author:** Michael Besser, Leuphana Universität Lüneburg, Germany; **Co-Author:** Larissa Altenburger, Leuphana University of Lüneburg, Germany; **Co-Author:** Natalie Tropper, Georg-Christoph-Lichtenberg-Schule Kassel, Germany; **Co-Author:** Maike Hagenau, University of Hamburg, Germany

Due to increasing numbers of study applicants in Germany, which often exceed the amount of available study places, universities are confronted with the challenge of selecting the "most suitable" candidates. According to a decision of the German Federal Constitutional Court in December 2017, this selection must not be made solely on the basis of the university entrance qualification grade. At XXX, applicants for a teacher training programme in mathematics thus have the opportunity to gain additional credits in the selection process by taking a mathematics test, among other tests, and thereby increase their chances of being accepted to university. The paper examines the validity of this mathematics test on the basis of test data from applicants as well as pupils from grades 7, 9, and 11 of grammar and comprehensive schools. Results show that university applicants perform better than pupils from the 9th and 11th grades of grammar schools and these in turn perform better than pupils from the 7th grades and the 9th comprehensive school classes. Correlations of test performance and mathematics self-concept, mathematics self-efficacy, mathematics interest and enjoyment, and mathematics anxiety are all consistent with empirical results of former studies.

These findings support the quality of the test instrument, which validly measures different levels of mathematics competence and can thus be used to evaluate applicants. In the context of the mentioned decision of the German Federal Constitutional Court in December 2017, this result is of special interest for the development of standardized, subject-specific instruments for university selection processes.

What Features of Equivalence Problems Relate to Adults' Problem-Solving Performance?

Keywords: Achievement, Assessment Methods and Tools, Mathematics, Problem Solving

Presenting Author: Emine Simsek, Loughborough University, United Kingdom; **Co-Author:** Ian Jones, Loughborough University, United Kingdom; **Co-Author:** Iro Xenidou-Dervou, Loughborough University, United Kingdom

Many studies have investigated the effect of problem features on equation-solving performance on traditional arithmetic problems in the format of ' $a + b = c$ '. The consistent finding is that problem features such as problem size, position of the missing information, the number of operations, operands in the equation, and problems being solvable by a shortcut, affect problem difficulty. Despite this, little research has systematically investigated the association between problem features and equation-solving performance for equivalence problems that have operations on both sides of the equals sign, e.g. $a + b = \underline{\quad} + d$. The present study sought systematic evidence about which features of equivalence problems relate to problem difficulty. Particularly, we investigated whether the position of the unknown (either in relation to the equals sign or within the expression) and problems being easily solvable by a shortcut influence adults' performance. A hundred and forty adults took part in the study and answered 96 equivalence problems. Our results showed that problems being solvable by a shortcut influences adults' equation-solving performance (i.e. accuracy and response time), suggesting that this feature directly influences strategy choice.

'Finally studying for myself!' Examining agency in summative and formative self-assessment models

Keywords: Assessment Methods and Tools, Higher Education, Mathematics, Social Sciences

Presenting Author: Juuso Henrik Nieminen, University of Eastern Finland, Finland; **Co-Author:** Laura Tuohilampi, UNSW, Australia

Promoting student agency has been introduced as the primary function for new generation assessment environments. In this study we introduce two models of self-assessment as a way to foster student agency. A socio-cultural framework was utilised to understand the interaction between student agency and self-assessment. Through a comparative design, we investigated whether formative self-assessment and summative self-assessment, based on self-grading, would offer students different affordances for agency. The results show that while both models offered affordances for agentic learning, future-driven agency was only presented by the students studying according to the summative model. Our results highlight the importance of assessment innovations in both formative and summative assessment if agency of students is to be promoted, and the role of self-assessment in the process.

Session V 4

26 August 2021 18:45 - 19:45

Session Room 18

Single Paper

Higher Education

Assessment Methods and Tools in Higher Education

Keywords: Achievement, Assessment Methods and Tools, Higher Education, Quantitative Methods, Reflection

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education

Chairperson: Jeff Vomund, George Mason University, United States

Comparing ways to conceptualize person-environment fit in higher education

Keywords: Achievement, Assessment Methods and Tools, Higher Education, Quantitative Methods

Presenting Author: Carla Bohndick, University of Hamburg, Germany; **Co-Author:** Jonas Breetzke, University of Hamburg, Germany; **Co-Author:** Tom Rosman, ZPID Leibniz Institute for Psychology Information, Germany

Researchers studying the concept of person-environment fit can choose between various measurement approaches. Even though distinctly different, the approaches often get used interchangeably, which makes picking the right approach for the situation difficult. In the present study, we contrast the nine most commonly used measurement approaches for person-environment fit and compare them in terms of explained variance. For five content dimensions, we obtained data on the P-E fit as well as subjective and objective study related outcomes of $N = 595$ university students from four German-speaking countries. We analysed the fit between the demands of the study program and the abilities of the student, and use the algebraic, squared and absolute difference score, their corresponding sum of differences, profile correlations, response surface analysis, and direct fit as measurement approaches. Our results indicate that the explained variance of the models is highly dependent on the measurement approach under consideration. First, response surface analysis explains the most variance for both subjective and objective outcomes. Second, profile correlations exhibit weak performance across all outcomes and dimensions. Third, when measuring subjective outcomes, the direct fit explains more variance than difference scores. Based on our analysis, we give recommendations on the use of person-environment fit measures in different scenarios. We hope that this contribution will help researchers to distinguish the different measurement approaches and apply them accordingly.

Designing an Online Self-assessment for Informed Study Decisions: The User Perspective

Keywords: Achievement, Assessment Methods and Tools, Higher Education, Quantitative Methods

Presenting Author: Laurie Delnoij, Open University, Netherlands; **Co-Author:** José Janssen, Open University of the Netherlands, Netherlands; **Co-Author:** Kim Dirkx, Open University, Netherlands; **Co-Author:** Rob Martens, Open University of the Netherlands, Netherlands

This paper presents the results of a user study, as part of the design-based development of an online self-assessment for prospective students in higher online education. The self-assessment consists of a set of tests – predictive of completion – and is meant to improve informed decision making prior to enrolment. The rationale being that better decision making will help to address the ongoing concern of non-completion in higher online education. A prototypical design of the self-assessment was created based on an extensive literature review and correlational research. The present study focused on investigating the potential users' perspective on the self-assessment (including the feedback it provides). Results from a survey among prospective students ($N = 66$) showed that three out of the five tests included in the current prototype were considered relevant by prospective students. Moreover, students rated eleven additionally suggested tests – currently not included – as relevant concerning their study decision. Expectations regarding the feedback to be provided in connection with the tests include an explanation of the measurement and advice for further preparation. A comparison of the obtained scores to a reference group (i.e., other test-takers or successful students) is not expected. At the conference, a short interactive demonstration of the self-assessment is provided and implications for further development and evaluation of the self-assessment are discussed.

The Resilience Journal: Fostering Resilience at the University through a Diary Intervention

Keywords: Assessment Methods and Tools, Higher Education, Quantitative Methods, Reflection

Presenting Author: Max S. Lohner, University of Mannheim, Germany; **Co-Author:** Carmela Aprea, University of Mannheim, Germany

Fostering resilience of university students has become of high priority to universities in order to support students in difficult times through their studies. Existing interventions, however mainly focus on face-to-face interventions, which are difficult to execute during the COVID-19 pandemic. In order to close this gap and support students during this challenging time, a *Resilience Journal* was developed for this study. In an online intervention, 100 university students were randomly assigned into two groups, which filled out different versions of the *Resilience Journal* for five days. Resilience and satisfaction with life were measured before and after the intervention, and nine daily items monitored fluctuation in resilience. Results revealed no significant differences between the two groups, but a significant increase in resilience, measured through the Brief Resilience Scale, for both groups combined. Satisfaction with life also increased over the course of the intervention, however not significantly. The results imply that resilience can potentially be fostered through different forms of the *Resilience Journal* without the need for face-to-face interventions. The *Resilience Journal* therefore seems to provide an effective, efficient and widely accessible form of intervention with

the potential to gain new insights into the dynamic nature of resilience.

Session V 5

26 August 2021 18:45 - 19:45

Session Room 7

Single Paper

Learning and Instructional Technology, Motivational, Social and Affective Processes

Meta-analysis and Motivation

Keywords: Attitudes and Beliefs, Computer-assisted Learning, Instructional Design, Meta-analysis, Motivation, Reading Comprehension, Student Learning, Teaching/Instruction

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 08 - Motivation and Emotion

Chairperson: Julia Eberle, Ruhr-Universität Bochum, Germany

Do Achievement Goals for Teaching Matter and if so, How Much? A meta-analytic review

Keywords: Meta-analysis, Motivation, Student Learning, Teaching/Instruction

Presenting Author: Ruth Butler, Hebrew University of Jerusalem, Israel; **Co-Author:** Martin Daumiller, University of Augsburg, Germany; **Co-Author:** Raven Rinas, Augsburg University, Germany

What do teachers strive to achieve, and does this matter? We begin with a brief overview of an achievement goal approach to teacher motivation, presenting major constructs, measures, and theoretical predictions. We then present the first meta-analytic review of associations between teachers' learning, performance-approach, performance-avoidance, work-avoidance, and relational goals and teachers' self-regulation, professional engagement, self-efficacy, and instruction. Results from 58 studies ($N = 17,336$ teachers) confirmed that learning goals are very adaptive. Effect sizes were moderate for desirable learning behaviors, positive engagement, self-efficacy, and mastery-oriented, student-focused instruction and small but not trivial for associations with undesirable avoidant behaviors and negative engagement. Similar patterns emerged for relational goals. Performance-approach and work-avoidance are maladaptive, showing small to moderate associations with undesirable outcomes, including performance-orienting, teacher-focused instruction. Work-avoidance is also negatively associated with adaptive outcomes. Performance-approach goals matter less, but tend to be detrimental; associations were trivial with adaptive outcomes, but quite substantial with avoidant behaviors and performance instruction. Moderator analyses yielded interesting effects for teacher type (preservice, inservice schoolteachers, college) and instruction informant (teacher vs. students). Thus, achievement goals matter for both teachers and teaching. We supplement these results with evidence that they matter for students as well, in part via teacher goal influences on teachers' instructional behaviors. We conclude with implications for continuing theory and research on teacher motivation and for educational policy and practice.

Effects of Computer-Based Feedback on Learning and Motivation: A Network Meta-Analysis

Keywords: Computer-assisted Learning, Instructional Design, Meta-analysis, Motivation

Presenting Author: Ute Mertens, IPN - Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:** Bridgid Finn, ETS, United States; **Co-Author:** Marlit Annalena Lindner, IPN - Leibniz Institute for Science and Mathematics Education, Germany

Feedback is considered to be one of the most effective instructional tools to improve learning. Specifically, automated computer-based feedback becomes more and more important in the ongoing digitalization of learning and testing environments, which allows for an efficient feedback implementation. Previous meta-analyses suggest that different types of feedback, such as *knowledge of results* (KR), *knowledge of correct response* (KCR), *elaborated feedback* (EF), and *answer-until-correct* (AUC) feedback are not equally effective. This heterogeneity of feedback interventions points towards a role of learner characteristics, feedback characteristics, and assessed outcome measures. Here, we present a novel network meta-analysis that allowed us to compare (i.e., rank) different types of computer-based feedback regarding their effects on (low and higher order) performance measures and motivational parameters. A broad literature search allowed us to include 184 effect sizes from 73 experimental studies to rank and compare the four feedback variants compared to a no feedback control group. Our results indicate that EF is likely to be the most effective for low (i.e., recall/recognition) and higher order (i.e., transfer) learning outcomes, as well as motivational outcomes compared to the other feedback variants. The ranking results further show that AUC performed second best regarding performance related outcomes, showing a slight advantage over KCR, while KR turned out to be the least effective feedback variant. Overall, simple feedback interventions (KR, KCR) seem to reduce time on task, whereas complex variants (EF, AUC) showed effects comparable to no feedback conditions. Further subgroup analyses (e.g., test item formats) will be presented.

Effectiveness of interventions that foster reading motivation: A meta-analysis

Keywords: Attitudes and Beliefs, Meta-analysis, Motivation, Reading Comprehension

Presenting Author: Lisa van der Sande, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:** Roel van Steensel, Erasmus University Rotterdam, Netherlands; **Co-Author:** Suzanne Fikrat-Wevers, Erasmus MC, Netherlands; **Co-Author:** Arends Lidia, Erasmus University Rotterdam, Netherlands

Purpose. Reading motivation plays an important role in students' reading development. Students who are motivated to read, read more often and use more effective reading strategies, resulting in better reading skills. Thus, the promotion of reading motivation may have beneficial effects on students' reading achievement. The aim of the current meta-analysis was to provide an overview of theory-driven reading motivation interventions and to investigate effects on reading motivation and comprehension. Methods. A literature search in eight scientific databases resulted in 5,815 titles, which were screened by two researchers. 33 studies met all inclusion criteria and were (double) coded. Weighted mean effects sizes on reading motivation and reading comprehension were computed in Comprehensive Meta-analysis 2.0. Moderator analyses were conducted to examine whether intervention effects are moderated by intervention, sample, and study characteristics. Results. Preliminary results indicate significant, positive effects on reading motivation ($d = 0.55$) and reading comprehension ($d = 0.29$). Effectiveness was moderated by several intervention and sample characteristics. Most importantly, we found that interventions that triggered students' interest, provided autonomy support, fostered social motivation, and stimulated mastery goals had larger effects on reading motivation than those that did not. Conclusion. The outcomes of this meta-analysis suggest that investing in reading motivation through interventions is a fruitful way of contributing to reading motivation and comprehension. The results also provide information on what are the most effective ingredients of such interventions, which may have important implications for practice.

Session V 6

26 August 2021 18:45 - 19:45

Session Room 5

Single Paper

Motivational, Social and Affective Processes

Motivation and Student Learning

Keywords: Motivation, Quantitative Methods, Student Learning, Teaching/Instruction

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Fani Lauermann, TU Dortmund University, Germany

The Relations between Teacher Interest, Instructional Quality, and Student Motivation

Keywords: Motivation, Quantitative Methods, Student Learning, Teaching/Instruction

Presenting Author: Marthe Claire Frommelt, University of Potsdam, Germany; **Co-Author:** Ulrich Schiefele, University of Potsdam, Germany

This presentation focuses on the concept of teachers' professional interests. It first outlines the theoretical considerations leading to maintain that there are distinct teacher interests, and that these interests might be important for teachers' instructional behavior and students' motivation. Second, we give a brief overview on previous findings involving teacher interests. These findings indicate that among the proposed teacher interests (subject-related, didactic, educational), teachers' educational interest stands out with significant direct relations to teachers' quality of instruction and significant indirect relations (mediated by instruction) to students' motivation. Finally, we report results from a recent longitudinal study addressing the relations between teacher interests, instructional practices, and student motivation over time.

Do Teachers' Competence Beliefs Matter for Students' Academic Outcomes?

Keywords: Motivation, Quantitative Methods, Student Learning, Teaching/Instruction

Presenting Author:Inga ten Hagen, TU Dortmund University, Germany; **Presenting Author:**Fani Lauermann, TU Dortmund University, Germany; **Co-Author:**Jacquelynne S. Eccles, UC-Irvine, United States

Teachers' perceived teaching competence is a multi-faceted motivational factor that can shape teachers' instructional decisions, persistence, and engagement in teaching. However, theorized associations between teachers' perceived teaching competence and student outcomes remain understudied, and existing evidence is inconclusive. First, we review different conceptualizations of teachers' competence beliefs and their hypothesized effects on students and identify important gaps in existing theory and research. Second, we present an empirical study designed to overcome several of the identified research gaps by focusing on the interrelations between teachers' perceived *student-specific* and *subject-specific* teaching effectiveness, student-reported instructional quality, and academic motivation in the mathematics and reading domains, controlling for pre-existing differences in students' motivation, cognitive ability, grades, and family background. Data from 48 mathematics and 55 reading teachers and their elementary school students ($N_{mathematics}=449/N_{reading}=568$) were included in the analyses. A set of domain-specific multi-level path analyses revealed significant within-classroom predictive effects of teacher-reported student-specific teaching effectiveness on student-reported instructional quality and motivation, but no significant between-classroom effects. Pre-existing differences in students' motivation positively predicted teachers' perceived teaching effectiveness in mathematics but not reading. Across both subjects, the more effective a teacher felt in teaching a particular student, relative to the class-average, the more likely this student perceived the teacher's instruction as motivating, which then predicted a positive change in the student's interest in mathematics and reading. Different results across levels of analysis (between-/within-class) and subjects (math/reading) underscore the importance of examining both student-specific and subject-specific associations between teachers' perceived teaching competence and student outcomes.

Session V 7

26 August 2021 18:45 - 19:45

Session Room 1

Single Paper

Cognitive Science

Science Education

Keywords: Comprehension of Text and Graphics, Content Analysis, Distributed Cognition, Emotion and Affect, Neuroscience, Primary Education, Science Education, Secondary Education

Interest group: SIG 02 - Comprehension of Text and Graphics

Chairperson: Qiyun Zhu, China

Are students invited into socioscientific discussion? A discourse analysis of science textbooks

Keywords: Comprehension of Text and Graphics, Content Analysis, Science Education, Secondary Education

Presenting Author:Ka Lok Cheng, The University of Hong Kong, Hong Kong

The current study aims to examine whether science textbooks encourage students to participate in the discussion on socioscientific issues (SSI). Through social constructionist lens and applying the discourse analysis frameworks and tools, the linguistic features of SSI-related text in nine sets of science textbooks used by senior secondary (year 10-12) students in Hong Kong were examined. Through analyzing how different participants were represented, it was found that most human entities except unspecified groups of "some people" were excluded in most sample sentences. Abstract entities were activated as if they have agency on their own apart from human actions, and humans were represented as mostly participating in mental and verbal processes instead of material processes that bring about effects on other parties. There is also a lack of personalization in sentences that human agents were mentioned, while abstraction and collectivization of participants were commonly observed. It could be reasonably asserted that students as future citizens were disempowered through these SSI-related text segments, as the agency of individuals were downplayed and the victimizers responsible for the socioscientific problems were shielded from scrutiny. The current study calls for more fine-grained studies on the processes that shape citizens' participation in SSI and the development of guidelines for proper representations of participants in SSI-themed learning materials.

Scientists' emotions in children's drawings

Keywords: Content Analysis, Emotion and Affect, Primary Education, Science Education

Presenting Author:Vasilia Christidou, Aristotle University of Thessaloniki, Greece; **Co-Author:**Fotini Bonoti, University of Thessaly, Greece; **Co-Author:**Vassilia Hatzinikita, Hellenic Open University, Greece

During the past decades, research has extensively investigated the stereotypic image of scientists as represented in children's drawings. In an attempt to shed light to other, less explored aspects of the complex construct of the image of scientists, this study focuses on the emotions children attribute to scientists in their drawings, the graphic cues they employ to depict these emotions and children's justifications of attributed emotions. Participants were 245 children divided into three age-groups with a mean age of 5, 8 and 11 years, recruited from public schools in Greece. Each child was asked to draw a scientist experiencing an emotion and to describe his/her drawing, label and justify the emotion depicted. Data analysis indicated that participants mostly ascribed positive emotions to scientists, which they mainly associated with scientists' self-efficacy. Children mainly relied on facial graphic cues for depicting scientists' emotions, while postural and contextual cues were less frequently used. Justifications varied as a function of age, indicating that as they get older children seem to acquire a broader and more sophisticated image of scientists' emotions. By identifying the emotions prompted by scientific work, this study provides a novel, complementary perspective to the kaleidoscopic construct of students' image of scientists.

Learning and expertise with scientific external representations: a 4E cognition model

Keywords: Comprehension of Text and Graphics, Distributed Cognition, Neuroscience, Science Education

Presenting Author:Prajakt Pande, Roskilde University, Denmark

Mainstream cognitive science has criticised and moved away from the classical cognitivist information-processing approaches which underestimated the roles played by (human) body and action in cognition. These approaches theorised cognition as symbolic processing of abstracted information that is centralised in the brain and is completely dissociated from one's sensory modalities as well as external environment. In contrast, more than two decades of cognitive and neuroscience research has demonstrated that cognition, even at the neural-activity level, depends critically on one's body, material (and sociocultural) elements in one's surroundings, and body-based sensorimotor interactions one has with those elements. Yet, the cognitivist accounts of the mind are unfortunately still influential in various learning and instruction research communities in science, technology, engineering, and mathematics (STEM), primarily in the ways they conceptualise (i) learning and expertise development processes, and (ii) instructional designs to support these processes. In this paper, I argue for a perspective-shift in future theoretical, empirical and design research endeavours in STEM learning and instruction, from the symbol-based information-processing theories of the mind, to the more recent action-based 'field' approaches (e.g. extended, enactive, and embodied cognition). With support from diverse cutting-edge advances in cognitive science, neuroscience and STEM education, I propose a new model of the learning mind, and discuss its

implications to learning and instruction research, particularly in the context of learning and expertise with multiple external representations.

Session V 8

26 August 2021 18:45 - 19:45

Session Room 2

Single Paper

Developmental Aspects of Instruction, Motivational, Social and Affective Processes

Self-regulation

Keywords: Cognitive Development, Collaborative Learning, Early Childhood Education, Learning Approaches, Motivation, Quantitative Methods, Self-regulation

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Debra Myhill, University of Exeter, United Kingdom

Primary school students' academic help-seeking and help-giving: an intraindividual study

Keywords: Collaborative Learning, Motivation, Quantitative Methods, Self-regulation

Presenting Author: Kyle Davison, University of Oxford, United Kingdom; **Co-Author:** Kathy Sylva, University of Oxford, United Kingdom; **Co-Author:** Lars-Erik Malmberg, University of Oxford, United Kingdom

There is growing interest among education researchers in the analysis of learning processes, and the field of help-seeking may benefit from adopting this approach. Help-seeking research has tended to infer behaviour from post hoc reflections or experimental procedures outside of the classroom context, limiting our understanding of actual helping behaviour in the classroom. To address this gap, the present study adopted an intraindividual (end-of-each-lesson self-report) design to examine the academic help-seeking interactions (help-seeking and help-giving) of 347 students (aged 8.2 to 11.5 years) across 14.2 lessons. Multilevel analyses of the two-level hierarchical questionnaire data (situations nested within students) indicated that situational experiences (e.g. need for help, understanding, difficulty, and effort) during learning tasks were significant predictors of teacher and peer help-seeking interactions, and of the type of help sought and given by students. Individual differences were found to explain associations at the situation level. High performing girls for whom English is their first language were more likely than their classmates to seek and give help to peers. Conversely, students with special educational needs and disabilities, and students for whom English is an additional language (EAL) were more likely to engage in avoidant behaviours, such as not seeking help from peers and ignoring help requests. EAL students were more likely to be involved in expedient (nonadaptive) help-seeking interactions, such as asking for and giving the answer.

The relation between self-regulation and cognition of pre-school children: a longitudinal study

Keywords: Cognitive Development, Early Childhood Education, Quantitative Methods, Self-regulation

Presenting Author: Sina Fackler, Leibniz-Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:** Lars-Erik Malmberg, University of Oxford, United Kingdom; **Co-Author:** Alexander Baron, E.L. Haynes Public Charter School, United States; **Co-Author:** Kate Mee, University of Bath, United Kingdom

This study investigates predictors of self-regulation (SR) at 51 months and its relation to verbal and non-verbal cognitive abilities (VCA, NVCA) as indicators of school readiness using data from the longitudinal Families Children and Child Care-study ($n = 886$). Age-specific measures for self-regulation (i.e. Bayley Social-and Emotional Development Index) and cognition (i.e., Bayley Developmental Index (18m), Reynell Language Scale 36m and British Ability Scale 51m) at 18 months, 36 months and 51 months were used to assess the children's abilities at each time point. The analysis was carried out using SEM in MPlus. Prior measures of SR and cognitive abilities (CA) at 18 months showed an indirect effect of these measures on SR 51m and VCA, where CA 36m mediated the effect. Here, also family SES, female sex and time spent in day-care (more or less than 12h/week at age three) predicted SR 51m. For NVCA, only family SES predicted SR 51m and early CA 18m only had a mediated effect on SR 51m through SR 18m. For VCA, the development of SR in relation to the parents and child features seemed to make a larger difference than for NVCA. This suggests that NVCA and VCA as components of school readiness and SR as an important predictor of educational outcomes are acquired through different pathways and educational settings in a child's cognitive and behavioural development and preparation for school readiness.

Associations Between Children's Self-Regulation and Their Approaches to Learning across Preschool

Keywords: Early Childhood Education, Learning Approaches, Quantitative Methods, Self-regulation

Presenting Author: Carolina Guedes, Faculty of Psychology and Educational Sciences, University of Porto, Porto, Portugal; **Co-Author:** Marina Lemos, University of Porto, Portugal; **Co-Author:** Joana Cadima, University of Porto, Portugal

It is widely acknowledged that children's learning behaviors are crucial for their future learning and a cornerstone for a successful transition from preschool to elementary school (Li-Grining et al., 2010; Vitiello et al., 2011). However, few studies have examined the precursors of key learning behaviors across early childhood, from crèche to elementary school entry. Drawing on the importance of preschool self-regulation for school adjustment, and following conceptual and empirical links between self-regulation and learning behaviors (McDermott et al., 2017; Sasser et al., 2015), the current longitudinal study aims to test if very young children's latent self-regulation (age 3) predicts key learning behaviors, such as persistence and motivation upon elementary school entry (age 6).

Participants were 268 Portuguese preschoolers (51.9% boys) with an average of 40.2 months ($SD = 4.04$), at the beginning of preschool (T1) and their lead teachers ($n = 29$) at the end of preschool (T2). At T1, direct assessments of children's self-regulation tapped into inhibitory control, selective attention, and working memory skills. At T2, teachers reported on children's learning behaviors across dimensions of attentional persistence and competence motivation using the PLBS (McDermott et al., 2002). Results showed that self-regulation at age 3 was a positive predictor of children's attentional persistence, but not competence motivation by age 6. These findings contribute to current evidence about the links between early self-regulation and later behavioral indicators of child persistence in learning tasks. Additionally, results provide further support for the importance of explicitly address and target self-regulation in early childhood curricula.

Session V 9

26 August 2021 18:45 - 19:45

Session Room 4

Single Paper

Culture, Morality, Religion and Education, Teaching and Teacher Education

Teaching and Teacher Education

Keywords: Attitudes and Beliefs, Cultural Diversity in School, Experimental Studies, In-service Teacher Education, Meta-analysis, Pre-service Teacher Education, Reflection, Social Interaction, Teacher Professional Development, Teaching Approaches, Teaching/Instruction

Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development

Chairperson: Michael Goller, Friedrich Schiller University Jena, Germany

Transformation of practices into dialogic teaching: towards a dialogic notion of teacher learning

Keywords: In-service Teacher Education, Teacher Professional Development, Teaching Approaches, Teaching/Instruction

Presenting Author: Valentina Guzmán, Universidad Alberto Hurtado, Chile; **Co-Author:** Antonia Larraín, Universidad Alberto Hurtado, Chile

The dialogic teaching approach has been widely studied, both empirically and theoretically. However, despite four decades of research suggesting that dialogical interactions promote students' learning, it has been very difficult to reflect this in practice. Teacher professional development programmes oriented towards promoting dialogic pedagogies have been based on socio-cultural approaches centred on teachers' reflective analysis of classroom practices. Studies show that reflecting on pedagogical practices is necessary but insufficient to promote the desired changes. Beyond reflection, initiatives centred on scaffolding

the practice with dialogic discursive repertoires have seen more successful results. This suggests that centring on the practice seems to be fundamental to change. Nevertheless, the theoretical basis has not been elaborated further to understand why centring on the direct scaffolding of practice would promote teachers' learning and pedagogical practice transformation. In order to account for the available empirical evidence, drawing on the works of Bakhtin and Vygotsky, the aim of this paper is to elaborate on a dialogical theory of teacher learning. Using this theoretical approach, different theoretical views of learning, teacher professional development programmes and the main tensions therein are discussed.

How effective are coaching and mentoring for student teachers' instructional skills? A meta-analysis

Keywords: Experimental Studies, Meta-analysis, Pre-service Teacher Education, Teaching/Instruction

Presenting Author:Sog Yee Mok, University of Zurich, Switzerland; **Co-Author:**Fritz C. Staub, University of Zurich, Switzerland

During the teaching practicum, pre-service teachers practice instructional skills such as lesson planning and clarity of instruction. Different approaches to assisting pre-service teachers with coaching, mentoring, or supervision have been developed to improve pre-service teachers' instructional skills during the practicum. We conducted a meta-analysis based on studies using a quasi-experimental or experimental design with a control group. The results showed a small and significant overall effect on instructional skills ($d = .41$). Different moderators were tested. Cooperating teachers' or supervisors' cognitive modeling (i.e., making cognitive processes explicit and demonstrating teaching-related practices) of lesson planning and teaching practices based on the cognitive apprenticeship framework was a significant moderator and showed a large effect ($d = .89$). The results will be discussed with regard to further developments of coaching, mentoring, and supervision to effectively support pre-service teachers' instructional skills.

Simulation Games in Teacher Education: Fostering Reflection and Belief Change on Inclusion

Keywords: Attitudes and Beliefs, Experimental Studies, Pre-service Teacher Education, Reflection

Presenting Author:Katja Adl-Amini, TU Darmstadt, Germany; **Co-Author:**Maria Theresa Messner, Goethe-University Frankfurt, Germany; **Co-Author:**Ilonca Hardy, Goethe-Universität Frankfurt, Germany

In the context of inclusive education, teachers need to critically reflect on their own beliefs and institutional conditions to deal with specific dilemmas of difference as in the ones of identification, curriculum and placement (e.g. Norwich, 2008). However, empirical studies show that student teachers' reflections are often on a low level and rarely include multiple perspectives (Hatton & Smith, 1995; Körkkö, Kyrö-Ämmälä & Turunen, 2016) und beliefs. Thus, there is a need to foster higher-level reflection in university teacher education. The present study aims at evaluating a simulation game of a decision making process on placement in inclusive education with regard to student teachers' change of beliefs and level of reflection. In a quasi-experimental repeated measures design we varied whether $N=125$ teacher students participated in a simulation game ($n=46$), a group discussion ($n=47$), or no intervention ($n=32$). For pre-post comparisons, we coded student teacher's written reflections on a video vignette (interrater-agreement > 80%). We also employed a questionnaire on inclusive beliefs (Bosse & Spörer, 2014; $\alpha > .86$). Using repeated measures ANOVAs, we found a significant increase with regard to student teacher's levels of reflection and positive beliefs on inclusive education with an effect of time, reflection $F(1.0)=28.27$, $p=.00$, $\eta^2=.18$; beliefs $F(1.0)=4.55$, p

New approach to teachers' intercultural competencies: implicit theories of malleability

Keywords: Attitudes and Beliefs, Cultural Diversity in School, Social Interaction, Teaching/Instruction

Presenting Author:Inkeri Rissanen, Tampere University, Finland; **Co-Author:**Elina Kuusisto, Tampere University, Finland

Attitudes and beliefs are generally acknowledged as a core dimension of teachers' intercultural competence but there is little consensus on what these beliefs are, or how they can be altered. This paper will present an early-phase mixed methods project which studies teachers' intercultural competence by drawing on social psychological research on implicit theories of malleability. People have different implicit theories concerning the extent to which traits of individuals and groups are malleable or fixed. These theories have implications for how people make sense of the social world, they predict prejudices and stereotyping. However, theoretical models of intercultural competence do not take account of the impact of implicit theories of malleability for intercultural interactions. We investigated the association of Finnish teachers' ($n=360$) implicit malleability theories with the affective domain of teachers' intercultural competence (polyculturalist beliefs, enthusiasm for teaching in the context of diversity and teaching for social justice -beliefs). We tested our hypothesised model with structural equation modeling: the fit of the data to the model was good. Our results bring preliminary evidence of the important role of malleability beliefs and polyculturalist beliefs as the basis of teachers' intercultural competence. Implications for teacher education and further research are discussed.

Session V 10

26 August 2021 18:45 - 19:45

Session Room 16

Single Paper

Teaching and Teacher Education

Pre-service Teacher Education

Keywords: Attitudes and Beliefs, Higher Education, Pre-service Teacher Education, Quantitative Methods, Social Sciences, Teacher Professional Development, Workplace Learning

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Erika Schlatter, Radboud University, Netherlands

Mentors and their professional vision of inclusive classrooms: Do they reach the expert norm?

Keywords: Pre-service Teacher Education, Quantitative Methods, Social Sciences, Workplace Learning

Presenting Author:Ine Ophalvens, Ghent university, Belgium; **Co-Author:**Karolien Keppens, Ghent University, Belgium; **Co-Author:**Hanne Tack, Ghent University, Belgium; **Co-Author:**Ruben Vanderlinde, Ghent University, Belgium

In research on teacher education, researchers point to the crucial role mentors play in preparing student teachers to become effective teachers. Mentors are often referred to as experts of practice, but this assumption has not yet been confirmed empirically. This study adopts a video-based comparative judgement instrument to investigate whether or not mentors are experts of practice by examining their professional vision. Given todays' diverse classrooms, mentors' professional vision on differentiated instruction (DI) and teacher-student interactions (TSI) will be investigated. Mentor' professional vision will be compared with a previous explored expert benchmark through a misfit measure. The results indicate that mentors' ability to notice TSI and DI is quite congruent with experts' ability. Mentors also pay attention to aspects of TSI and DI in videoclips. Afterwards, mentors' professional vision is compared with the professional vision of student teachers ($n=2168$) and regular classroom teachers ($n= 996$) through a univariate regression analysis and Bonferroni tests. The results indicate that mentors performed better than student teachers in noticing aspects of TSI and DI in classroom video clips, but not significantly better than regular classroom teachers. With regard to mentors' reasoning, they perform not significantly better than regular classroom teachers and student teachers. Only mentors teaching in secondary education perform better in their reasoning on TSI compared to student teachers. The results show that mentors are to some extent experts on TSI and DI given the rather low misfit measure, but they do no perform better than regular teachers without a mentor function.

Student Teachers' Beliefs about the Role of Teachers: A Person-Centred Approach

Keywords: Higher Education, Pre-service Teacher Education, Quantitative Methods, Teacher Professional Development

Presenting Author:Daniel Mann, University of Bamberg (Otto-Friedrich-Universität Bamberg), Germany; **Co-Author:**Jennifer Paetsch, University of Bamberg, Germany; **Co-Author:**Donata Perakis, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:**Barbara Drechsel, University of Bamberg, Germany

There is broad consensus that not only knowledge but also beliefs are a key component of teachers' professional competence. This study focused student teachers' beliefs about the role of teachers during initial teacher education. We investigated six role facets in a multi-cohort-sample of 1319 student teachers while using Latent--Profile--Analysis (LPA). Results reveal that student teachers consider all six role facets (conveyor of knowledge, mediator, pedagogue, helper, counselor, evaluator) as important or very important. Three profiles of different agreement-levels were identified using LPA. Even though we found no

group differences for study duration, and number of internships, there were effects for type of school, additional practical experiences and reflection of it.

Domain-specific mindsets of German student teachers

Keywords: Attitudes and Beliefs, Pre-service Teacher Education, Quantitative Methods, Teacher Professional Development

Presenting Author:Katharina Hilpert, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Janina Roloff-Bruchmann, IPN - Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Karin Guill, Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Uta Klusmann, Leibniz Institute for Science and Mathematics Education (IPN), Germany

Teacher mindsets on malleability and fixedness of abilities and intelligence have been shown to be relevant for students' motivation and achievement. However, research on structure of teacher mindsets and associations with aspects of teachers' professional competence is still in its infancy. Thus, we examined structure and correlates of domain-specific mindsets on fixedness of abilities in two subjects of 1192 student teachers in Germany. We first tested the factorial structure of domain-specific fixed mindsets and fixed mindsets on intelligence, finding them to be two correlated but separable constructs. Moreover, domain-specific fixed mindsets were found to be negatively related to the student teachers' enthusiasm and pedagogical interest. In line with prior research, we found student teachers to show higher domain-specific fixed mindsets in math-intensive subjects than in other subjects. Contrary to cross-professional findings, domain-specific fixed mindsets of female student teachers were not higher than that of male student teachers in math-intensive subjects.

Session V 11

26 August 2021 18:45 - 19:45

Session Room 10

Single Paper

Assessment and Evaluation, Culture, Morality, Religion and Education, Learning and Instructional Technology

Attitudes and Beliefs

Keywords: Assessment Methods and Tools, Attitudes and Beliefs, Citizenship Education, Content Analysis, Educational Psychology, Higher Education, Instructional Design, Learning Technologies, Teacher Professional Development, Values Education

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education, SIG 19 - Religions and Worldviews in Education

Chairperson: Adrian Lundberg, Malmö University, Sweden

Design and evaluation of a scale measuring the protective factors of teachers' resilience

Keywords: Assessment Methods and Tools, Attitudes and Beliefs, Educational Psychology, Teacher Professional Development

Presenting Author:Athena Daniilidou, University of Macedonia, Greece; **Co-Author:**Maria Platsidou, University of Macedonia, Greece

Recently developed scales addressed -specifically- to teachers' resilience have profited the field; however, a growing number of studies reveals that critical protective factors of teachers' resilience have not been included in any of the existing scales. To this end, based on relevant qualitative data collected earlier, this study aimed to design and evaluate a more comprehensive scale for measuring the personal and environmental protective factors of teachers' resilience. The sample consisted of 407 primary school teachers. The Multidimensional Teachers' Resilience Scale (Mansfield & Wosnitza, 2015) and the Teachers' Resilience Scale (Daniilidou & Platsidou, 2018) were used to test the convergent validity of the new scale. The Maslach Burnout Inventory (Maslach & Jackson, 1986) and the Teachers' Sense of Efficacy Scale (Tchannen-Moran & Woolfolk Hoy, 2001) were used to assess the discriminant validity of the scale. Following factor analyses which identified the most relevant items of the new scale, item response theory analysis using a two-parameter logistic model (2PL) was applied to check the items within each factor. The final version of the new scale (Teachers' Protective Factors of Resilience Scale – TPFRS) includes 32 items which assess seven protective factors of teachers' resilience: values and beliefs, spiritual influences, emotional and behavioral adequacy, physical well-being, relationships within the school environment, relationships outside the school environment and the legislative framework of education. Regarding discriminant validity, results showed that the TPFRS is valid to assess teachers' protective factors of resilience and, thus it can be safely used in future research and interventions.

Higher education students' life purposes in The Netherlands and Finland

Keywords: Attitudes and Beliefs, Citizenship Education, Higher Education, Values Education

Presenting Author:Elina Kuusisto, Tampere University, Finland; **Co-Author:**Isolde De Groot, University of Humanistic Studies, Netherlands; **Co-Author:**Doret de Ruyter, University of Humanistic Studies, Netherlands; **Co-Author:**Ingrid Schutte, Hanzehogeschool Groningen University of Applied Sciences, Netherlands; **Co-Author:**Iinkeri Rissanen, Tampere University, Finland; **Co-Author:**Päivi Virtaainen, Tampere University of Applied Sciences, Finland

The focus of this study is on the life purposes of Dutch (n=635) and Finnish (n=693) higher education students. Contents of life purposes and whether they were oriented towards the self or to others were investigated by means of qualitative content analysis. The most frequently mentioned life purpose was *happiness* in both countries. Few Dutch students referred to family or close *relations*, aspects that ranked highly among Finnish students. A substantial number of Dutch students at a university with a strong civic profile aimed to make the world more *humane and sustainable* on the individual, interpersonal and structural level. In other universities that had more general profile students had mostly a self-focus indicating low interest in contributing to society. The results suggest a need for whole person approach for both Dutch and Finnish higher education to support development of other orientation among the students towards serving society.

Examining stakeholders' representations on the exploitation of educational Socially Assistive Robots

Keywords: Attitudes and Beliefs, Content Analysis, Instructional Design, Learning Technologies

Presenting Author:Panagiota Christodoulou, University of Western Macedonia, Greece; **Co-Author:**Dimitris Pnevmatikos, University of Western Macedonia, Greece

Emerging technologies, such as Socially Assistive Robots (SARs) are progressively exploited in learning and instruction. Although educators' effectiveness may be attributed to their teaching styles, SARs' effectiveness is ascribed to factors such as robots' social role. Current research has highlighted various social roles that stakeholders attribute to educational robots. Still, there is no study investigating whether stakeholders relate to the exploitation of the SAR in an educational context with the teaching style that educators display during learning and instruction. Additionally, research has emphasised mainly on students and teachers' views on the exploitation of robots in education, omitting other categories of educational stakeholders. In the current study, we investigated in focus groups discussions the representations of various educational stakeholders regarding the exploitation of SARs in education and we examined whether they attributed to educational SARs teaching styles characteristics. Data analysis was conducted through a Computer-Assisted Qualitative Data Analysis Software, following the deductive and inductive content analysis approach. Results revealed three higher-order categories regarding the role of the robot, the fields of SARs' exploitation as well as the social use of the robot and its potential distribution in the school environment. Representations differed depending on the gender, the role and the educational level of the stakeholders. It was evident that stakeholders implicitly attributed to SARs teaching styles characteristics. Results raise significant implications, *inter alia*, for the design of future learning environments integrating SARs.

Session V 12

26 August 2021 18:45 - 19:45

Session Room 8

Single Paper

Higher Education, Teaching and Teacher Education

Teacher Professional Development and Higher Education

Keywords: Case Studies, Communities of Practice, Higher Education, Mixed-method Research, Peer Interaction, Teacher Professional Development

Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education

Chairperson: Bart Rienties, Open University, United Kingdom

University teachers' enactment of feedback literacy during peer mentoring meetings

Keywords: Case Studies, Higher Education, Peer Interaction, Teacher Professional Development

Presenting Author:Rachelle Esterhazy, University of Oslo, Norway; **Co-Author:**Crina Damsa, University of Oslo, Norway; **Co-Author:**Thomas de Lange, University of Oslo, Norway

In this study, we study how university teachers enact teacher feedback literacy (TFL) during peer mentoring (PM) meetings. Drawing on sociocultural theories (Linell, 2009; Vygotsky, 1978), we propose that TFL is not an inherent trait or skill of individual teachers, but a situated practice performed in interaction with colleagues and students. Drawing on video observations from a sequence of peer mentoring meetings, we examine how teachers jointly reflect on past and prospective feedback dialogues, and the cognitive and social-affective support they are providing to their students. The findings indicate that teachers discuss a wide array of issues related to their feedback practices during PM. The topics include challenges of helping students to understand feedback comments, managing students' emotions related to critical feedback and making students aware of their strengths and weaknesses. An illustrative example is a teacher sharing her experiences of a student struggling with conducting qualitative data analyses. Together with her colleagues, the teacher defines the problem clearer and outlines an action plan to address the problem. This empirical illustration contributes to our understanding that TFL is a joint enactment of teachers making sense of their students' challenges with feedback and of how they may support their students' understanding and use of feedback in the future. In addition, our study further advances the empirical insights into typical challenges teachers face related to their feedback practices and what it means concretely to act and reflect in a feedback-literate way.

Unpacking effective mentorship practices in distance learning: a mixed method study

Keywords: Communities of Practice, Higher Education, Mixed-method Research, Teacher Professional Development

Presenting Author:Bart Rienties, Open University, United Kingdom; **Co-Author:**Julia Sargent, Open University, United Kingdom

The benefits of mentoring relationships for academic professional development have been widely documented, although mentoring support is not always easy to access. Current mentoring theories and models in higher education often fail to address how various social identities may impact the function, effectiveness, and stability of mentoring relationships. Using social identity theory we explored mentorship practices for 67 academic staff at one distance learning institution. In this mixed method study we unpacked with whom and perhaps more importantly how academic staff made sense of mentorship. The quantitative findings indicated that the number of years working at the institute negatively predicted being a mentee, and positively being a mentor, with gender and discipline as mediators. Follow-up interviews with 27 participants indicated a range of themes (e.g., time commitment, reflection, trusting relationship). A particular contribution to social identity theory is the intersection between gender and discipline, which seemed to have an opposite effect for mentee and mentorship.

Collective meaning-making in teacher educators' talk about academic writing instruction

Keywords: Communities of Practice, Higher Education, Peer Interaction, Teacher Professional Development

Presenting Author:Ingunn Ofte, Norwegian University of Science and Technology (NTNU), Norway

Grounded in sociocultural theory of learning which deems social interaction as crucial to knowledge construction, and an understanding of language as crucial in the process of jointly constructing meaning in shared contexts, this study examines the opportunities for collective meaning-making processes in collegial conversations. Investigating the interplay in a group of teacher educators at a Norwegian teacher training institution, focusing in particular on how they shape their discourse, the study aims to gain insight into how the teacher educators may co-construct knowledge about academic writing instruction practices in concert with their colleagues. To this end, 21 episodes from five collegial conversations were selected and analyzed. This process entailed analyzing the communicative projects and communicative actions in the episodes, as well as identifying types of talk as cumulative, exploratory or disputational. Preliminary findings suggest that the teacher educators' interactions are cumulative rather than exploratory or disputational. They also indicate that in terms of content, their interactions are descriptive rather than analytical. Consequently, this study finds that knowledge of academic writing instruction is co-constructed not through critical analysis or exploration of perspectives or beliefs; rather, it occurs as the teacher educators share their ideas, describe their practices and explain them in the conversations. Taking the opportunity presented in the collegial conversations to sensitize each other to the beliefs, understandings and perspectives existing within the group may help expand and deepen the group's shared knowledge of the multiple understandings, ideas, beliefs and perspectives of academic writing instruction practices in teacher education.

Session V 13

26 August 2021 18:45 - 19:45

Session Room 9

Single Paper

Learning and Instructional Technology

Teaching, Instruction and Learning Technologies

Keywords: Communities of Learners, E-Learning/Online Learning, Higher Education, Learning Technologies, Primary Education, Qualitative Methods, Student Learning, Teaching/Instruction

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Martin Gartmeier, Germany

Humanistic KB Community— Aspects of Teaching Practices of Educators in Future Learning Spaces

Keywords: Communities of Learners, Higher Education, Learning Technologies, Teaching/Instruction

Presenting Author:Yael Yondler, Kibbutzim College of Education, Technology and Art, Israel; **Co-Author:**Dovi Weiss, Kibbutzim College of Education, Technology and the Arts, Israel

This article presents a study into the aspects of teaching practices employed by educators in future learning spaces (FLSs) as based on a unique and innovative conceptual framework that incorporates a humanistic approach (Aloni, 2014a) and a sociocultural approach oriented to establishing knowledge-building communities (KBCs) (Scardamalia & Bereiter, 2014). This was a mixed method study based on semi-structured interviews with 12 lecturers who teach in FLSs, as well as closed-ended questionnaire distributed to 204 of their students. Study findings provide empirical evidence of primary aspects appearing in high frequency in teaching practices of teachers in FLSs: learner agency, using technology and complex digital literacies, building knowledge within the group, flexibility and dynamism in the space, knowledge sharing and KB between groups, and collaborative knowledge creation among groups. Furthermore, study findings indicate positive correlations between aspects that are learner-centered and aspects of social interactions in which learners consolidate their own body of knowledge. In regression, there are significant indications that using technology and complex digital literacies and KB within groups are predictive variables for learner agency in these learning spaces, and that learner agency, using technology and complex digital literacies, flexibility and dynamism in space are predictive variables for KB within groups. Theoretically, the current study proposes a broad empirical conceptual framework rooted in a theoretical perspective that incorporates the two described approaches. Practically, this study provides a pedagogical tool that may help teachers in FLSs in the future utilize and maximize the inherent pedagogical value of teaching in these environments.

What teachers think and do: adaptive teaching in blended classrooms

Keywords: Learning Technologies, Primary Education, Qualitative Methods, Teaching/Instruction

Presenting Author:Ina Cijvat, Radboud University, Netherlands; **Co-Author:**Eddie Denessen, Radboud University, Netherlands; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Peter Sleegers, BMC Groep, Netherlands

As primary school teachers are dealing with increasing diversity of students' cognitive ability, there is a growing need for adaptive teaching practices.

Educational technologies are proposed as a possible means to support adaptivity in classrooms. This novel context requires that teachers redevelop their adaptive teaching skills. At the heart of adaptive teaching is the ability to adjust to the needs of individual students. In this study we investigate moments of adaptation which are coded as routine or (thoughtful) change depending on the teachers' reflections. An in-depth multiple case study methodology was applied with twelve teachers (students 8 to 12 years) in three primary schools. Teachers' moments of adaptation in adaptive teaching were analysed. Teachers relatively often adjusted the instruction to their students, often based on their own observations of student learning, sometimes also based on the data on student learning provided by the educational technology. Preset decisions (i.e. decisions anticipated on in the lesson preparation phase) were proportionally more common at routine moments of adaptivity, while flexible (i.e. unanticipated) decisions were slightly more common during moments of (thoughtful) change. Also, teachers used the educational technology more frequently during moments of (thoughtful) change.

The Importance of HOW, WHY, and WHAT: Learnings from Setting up an Online Course Overnight

Keywords: E-Learning/Online Learning, Learning Technologies, Student Learning, Teaching/Instruction

Presenting Author:Alessia Ruf, School of Applied Psychology, University of Applied Sciences and Arts Northwestern Switzerland (FHNW), Switzerland;

Presenting Author:Anna-Lena Roos, University of Applied Sciences and Arts Northwestern Switzerland (FHNW), Switzerland; **Co-Author:**Livia Müller, University of Basel, Switzerland; **Co-Author:**Judith Müller, University of Basel, Switzerland; **Co-Author:**Klaus Opwis, University of Basel, Switzerland

The Corona crisis forced many educational institutions to abruptly convert their previous face-to-face learning contexts to remote online environments. In the present contribution, we investigated such an emergency situation by means of a concrete example of a Swiss language and integration school. We interviewed nine students and asked them about their perception of this "overnight" implementation. The results were structured based on the three main categories of the well-known "Universal Design for Learning" framework: the HOW, the WHY and the WHAT of learning. Results indicated that a huge effort was invested by teachers on the HOW of learning by promptly making the learning material available for online courses. Thus, less effort was invested in the categories WHY and WHAT of learning leading to students that were overwhelmed by the technology of the newly provided online tools and features and who received less opportunities to communicate and collaborate with teachers and fellow students. However, even little changes and adaptations could have made a big difference for addressing these issues which would further have enabled continuous improvements during the course. Implications on how to quickly and easily set up an online-course will be discussed.

Session V 14

26 August 2021 18:45 - 19:45

Session Room 11

Single Paper

Learning and Instructional Technology, Motivational, Social and Affective Processes

Educational Technology

Keywords: Attitudes and Beliefs, Communities of Practice, Competencies, Educational Technology, Pre-service Teacher Education, Self-efficacy

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson:Henrik Bellhäuser, Germany

Student teachers and task-related self-efficacy for using digital technologies

Keywords: Competencies, Educational Technology, Pre-service Teacher Education, Self-efficacy

Presenting Author:Ove Edvard Hatlevik, Oslo and Akershus University College of Applied Sciences, Norway; **Co-Author:**Louise Mifsud, OsloMet – Oslo Metropolitan University, Norway; **Co-Author:**Tonje Giæver, OsloMet – Oslo Metropolitan University, Norway; **Co-Author:**Bård Ketil Engen, OsloMet – Oslo Metropolitan University, Norway; **Co-Author:**Greta Gudmundsdottir, University of Oslo, Norway; **Co-Author:**Anubha Rohtagi, University of Oslo, Norway

The field of digital technologies within education is developing rapidly. This paper draws attention to student teachers' self-efficacy within different digital topics, in addition to examining how student teachers perceived educational usefulness (benefits) of digital technologies. Data consists of 563 student teachers from two Norwegian universities. The preliminary findings indicate that perceived educational usefulness is related to self-efficacy identified through four different aspects. Furthermore, the findings indicate that self-efficacy in using digital office tools, self-efficacy in editing, self-efficacy in cyber ethics and self-efficacy in teaching with technologies are four distinct variables. This means that these four concepts can help to nuance the understanding of different aspects of self-efficacy when using digital technology. It can have implications for the steps that teacher educations take when it comes to contributing to students' perceived competence and self-efficacy.

This Mentor Shapes "U": Change of Preservice Teachers' ICT Self-Efficacy During a Teaching Practicum

Keywords: Communities of Practice, Educational Technology, Pre-service Teacher Education, Self-efficacy

Presenting Author:Mathias Dehne, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Alexander Goeschner, Friedrich Schiller University Jena, Germany

The spread of COVID-19 necessitated digital learning for maintaining schooling around the world. Teacher self-efficacy is relevant for various student-related outcomes such as with regard to information and communications technology (ICT). This study proposes a change model for facilitating preservice teachers' ICT self-efficacy during their teaching practicum (TP). We investigated changes of $N = 102$ preservice teachers in their third academic year, which attended a five-month school internship. We shed light on the influence of perceived university supervision and mentoring quality in placement schools. Longitudinal data analysis was carried out using multilevel modeling. Results show that ICT self-efficacy followed a systematic quadratic trend with gains and losses across time, depicting the shape of an inverted "U". When the mentoring quality was included in the overall multilevel model, moderator effects of university supervision turned non-significant. Then, only the perceived mentoring quality moderated ICT self-efficacy slopes across the internship. Simple slope analysis revealed that the inverted "U"-trend is turned into a stable development if mentoring is perceived as highly qualitative. The findings are discussed with regard to the assumed change model and the research on which it is based.

Developing preservice teachers' digital competencies: Building blocks for an online/blended future

Keywords: Attitudes and Beliefs, Competencies, Educational Technology, Pre-service Teacher Education

Presenting Author:Jo Tondeur, Vrije Universiteit Brussel, Belgium; **Presenting Author:**Sarah Howard, University of Wollongong, Australia

Over 2020, online and blended learning has been rapidly adopted by school around the world, as a result of the COVID-19 pandemic. While not all new online practices will be retained, blended learning is highly likely to continue in schools. This significantly changes how preservice teachers' digital competencies are developed and how they are prepared for future ICT-integration. While it is generally agreed that multiple strategies are required to develop preservice teachers' digital competency, the question remains how these strategies may come together to support preservice teachers' different motivations. This study examines the key relationships among strategies to develop preservice teachers' digital competencies and 2) how the self-organization of these strategies changes in relation to preservice teachers' attitudes towards digital technology. To explore these questions, we analyzed preservice teacher questionnaire data ($N=931$) from 20 teacher training institutions in Belgium. Data is analyzed through the grouping of preservice teachers based on high and low attitudes towards digital technologies. Association rules analysis was conducted on each dataset to identify patterns among six strategies to teach digital competency. Findings show different patterns of associations among strategies for the two groups. Results from preservice teachers with more positive attitudes showed a very specific focus on Collaboration, while those with lower attitudes had an emphasis on Feedback. An important finding for this symposium is that differences may exist in how preservice teachers experience the development of digital competency in their training, which can inform future design of teacher training programs.

Session V 15

26 August 2021 18:45 - 19:45

Session Room 6

Single Paper

Motivational, Social and Affective Processes

Educational Psychology and Motivation

Keywords: E-Learning/Online Learning, Educational Psychology, Emotion and Affect, Goal Orientation, Higher Education, Motivation, Motivation and Emotion, Secondary Education

Interest group: SIG 08 - Motivation and Emotion, SIG 22 - Neuroscience and Education

Chairperson: Gamze Görel, Paderborn University, Germany

Mindset profiles of high school students: More complex than a growth or a fixed mindset

Keywords: Educational Psychology, Goal Orientation, Motivation, Secondary Education

Presenting Author:Sibel Altikulaç, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Tieme Janssen, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Smiddy Nieuwenhuis, VU University Amsterdam, Netherlands; **Co-Author:**Nienke van Atteveldt, Vrije Universiteit Amsterdam, Netherlands

Mindset – someone's implicit beliefs about the malleability of their intelligence - is thought to be the key construct influencing students' effort beliefs, achievement goals and academic motivation. All these constructs have been put forward as important factors in determining their academic achievement and well-being (e.g., Burnette et al., 2020; 2013; Dweck, 1999). However, many inconsistencies are found in mindset studies as well, suggesting a more complex interplay of these constructs. In line with a recent study (Yu & McLellan, 2020), a more data-driven *person-oriented* approach is applied in this current study to define different profiles based on mindset-related constructs. Mindset profiles of 724 young adolescents ($M_{age} = 12.8$ years; $SD_{age} = 0.5$ years; 46.7% female) were created based on the four mindset-related constructs (mindset, effort beliefs, goal orientation, and academic self-regulation scale) using latent profile analysis (LPA). The preliminary results show that four distinct profiles; Performance-Focused, Performance-Adverse, Disengaged, and Growth-Competitive profile. These profiles are fairly similar to the profiles found by Yu & McLellan (2020), suggesting that they might be common and robust profiles in secondary school students. Interestingly, the Growth-Competitive group was the largest group of our study, showing that most students use adaptive motivational strategies to increase their achievement. The smallest subgroup, Disengaged, shows a dislike towards any motivational strategy, possibly resulting in a lower or even problematic academic well-being. Future research should therefore focus on guiding this high-risk group.

The role of relatedness in online courses during social distancing

Keywords: E-Learning/Online Learning, Educational Psychology, Higher Education, Motivation

Presenting Author:Ayşenur Alp Christ, Institute of Education, University of Zurich, Switzerland; **Co-Author:**Vanda Sieber, Institute of Education, University of Zurich, Switzerland; **Co-Author:**Carmen Köhler, DIPF | Leibniz Institute for Research and Information in Education, Germany, Germany; **Co-Author:**Jana Helbling, Institute of Education, University of Zurich, Switzerland; **Co-Author:**Anna-Katharina Praetorius, Institut für Erziehungswissenschaft, Switzerland

During the first COVID-19 shutdown, courses at universities were taught online, which was repeatedly discussed to be associated with limited options for fostering interpersonal relations. According to self-determination theory, teachers can support their students' basic need for relatedness (i.e., peoples' desire for close relationships) with their teaching behavior to promote student motivation and well-being (Ryan & Deci, 2017). Whereas some research indicates that relatedness need satisfaction is impaired online (Butz & Stupnisky, 2016), no study has assessed the role of lecturers' relatedness support in this context so far. The present study tested how relatedness supportive behavior from lecturers affected motivation and well-being via relatedness need satisfaction during COVID-19 with $N = 337$ students. Moreover, we accounted for dispositional differences in the need for close relationships (affiliation motive) and general conditions of remote teaching (communication channels and course format). Mediation and moderated mediation SEM taking the multilevel structure of the data into account showed that the relation between relatedness support and student outcomes was explained via relatedness need satisfaction. The affiliation motive did not moderate the relationship. Regarding the overall conditions of teaching, the use of video chat facilitated the provision of relatedness support. The course format was not related to relatedness supportive behavior. Summing up, our study provides evidence that supporting relatedness is beneficial in terms of motivation and well-being in this specific setting. Moreover, the choice of communication channels could play an important role in how successful lecturers are in supporting students' relatedness.

Connections between temperament, perfectionism, and well-being at school

Keywords: Educational Psychology, Emotion and Affect, Motivation, Motivation and Emotion

Presenting Author:Anna Rawlings, University of Helsinki, Finland; **Co-Author:**Anna Tapola, University of Helsinki, Finland; **Co-Author:**Heta Tuominen, University of Turku, Finland; **Co-Author:**Markku Niemivirta, University of Eastern Finland, Finland

Temperamental sensitivities and perfectionistic tendencies both guide individuals' attitudes and emotional responses to potential failure and mistakes, and have been observed to be linked with each other. As these sensitivities and tendencies appear relevant also in the learning context, we examined among eighth-graders ($N= 411$) how temperamental sensitivities may predict perfectionistic tendencies, and how these sensitivities and tendencies may be connected with aspects of well-being at school. Participants responded to a questionnaire rating their temperamental sensitivities, namely, *punishment sensitivity*, *interindividual reward sensitivity*(i.e., reward derived from praise or attention), and *intraindividual reward sensitivity*on two sub-dimensions (enjoyment of novelty; positive expressiveness and enthusiasm over own actions and successes); *perfectionistic strivings*and *perfectionistic concerns*; and experiences of *school value*and *emotional exhaustion*. The influence of gender was controlled. Findings from Exploratory Structural Equation Modeling showed perfectionistic strivings to be positively predicted by novelty-seeking, whereas perfectionistic concerns was predicted positively by punishment sensitivity and interindividual reward sensitivity, and negatively by positive expressiveness. In turn, perfectionistic strivings predicted higher school value, and perfectionistic concerns lower school value and higher emotional exhaustion. Punishment sensitivity, novelty-seeking, and positive expressiveness were also direct predictors of higher school value, whereas interindividual reward sensitivity predicted lower school value and higher emotional exhaustion. Overall, the results reinforce previous studies, where intraindividual reward sensitivity and perfectionistic strivings have generally been associated with adaptive, and interindividual reward sensitivity and perfectionistic concerns with maladaptive outcomes. Further study is needed to support the well-being of all students, regardless of temperament.

Session V 16

26 August 2021 18:45 - 19:45

Session Room 12

Single Paper

Learning and Special Education, Teaching and Teacher Education

Self-efficacy in Teacher Professional Development

Keywords: In-service Teacher Education, Primary Education, Quantitative Methods, Self-efficacy, Self-regulation, Teacher Effectiveness, Teacher Professional Development

Interest group: SIG 14 - Learning and Professional Development, SIG 15 - Special Educational Needs

Chairperson: Azizul Ghofar Candra Wicaksono, University of Szeged, Doctoral School of Education, Hungary

Self-regulation and self-efficacy as resources for teachers to prevent strain and foster motivation

Keywords: Quantitative Methods, Self-efficacy, Self-regulation, Teacher Professional Development

Presenting Author:Christine Wolfgramm, University of Teacher Education Zurich, Switzerland; **Co-Author:**Zippora Bührer, Pädagogische Hochschule Zürich, Switzerland; **Co-Author:**Simone Berweger, Zurich University of Teacher Education, Switzerland; **Co-Author:**Andrea Keck Frei, Zürich University of Teacher Education, Switzerland; **Co-Author:**Christine Bieri Buschor, Zurich University of Teacher Education, Switzerland

Teaching is a challenging profession associated with an increased risk for a persistently high stress experience even beyond the career entry phase. Prolonged high professional demands can lead to emotional exhaustion or even burnout. In order to prevent such negative consequences, job and personal resources are crucial to prevent as well as cope with job-related stress. An important aspect of professional development, respectively a resource to deal with everyday professional challenges, are self-regulatory competences. There is also evidence from previous studies that a high level of occupational self-efficacy can protect against long-term consequences of stress. This paper examines the long-term interplay of personal resources (self-regulation, self-efficacy), motivation and strain for teachers at the end of their career entry phase. For this purpose, a cross-lagged panel model was calculated based on data from three measurement points of kindergarten and primary school teachers in Switzerland. The results suggest that teachers' self-efficacy has a positive effect on work engagement, which in turn positively feeds back on self-efficacy, while self-regulation reduces emotional exhaustion.

Sources of primary school teachers' self-efficacy to teach in inclusive classrooms

Keywords: Primary Education, Self-efficacy, Teacher Effectiveness, Teacher Professional Development

Presenting Author:Katja Franzen, Paderborn University, Germany; **Co-Author:**Frank Hellmich, Paderborn University, Germany; **Co-Author:**Barbara Moschner, Carl von Ossietzky Universität Oldenburg, Germany

The ratification of the UN-Convention on the Rights of Persons with Disabilities raises questions about the best preparation of teachers for their pending tasks in inclusive classrooms. Teachers' self-efficacy beliefs are regarded as a main personal resource that underlies the successful implementation of inclusion in schools. Self-efficacy is defined as the confidence in one's competences to achieve desired goals, even under testing circumstances (Bandura, 1997). Four sources are specified that form one's self-efficacy: mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states. However, regardless of the apparent importance of teachers' self-efficacy beliefs, there are only few studies that consider the impact of those sources on teachers' self-efficacy to teach in inclusive classrooms (e.g., Taliaferro, 2010). Therefore, we investigate the effects of mastery and vicarious experiences, verbal persuasion, and affective states on teachers' self-efficacy in inclusive education. In our study, $N=524$ German primary school teachers filled in a questionnaire that contains scales regarding their self-efficacy in and willingness to inclusive education as well as regarding the associated four sources. Results from structural equation modeling underline the importance of the different assumed predictors of teachers' self-efficacy and especially of teachers' mastery and vicarious experiences. Moreover, the results show a significant contribution of teachers' affective states to the variance of their self-efficacy, whereas verbal persuasion did not emerge as a significant unique predictor. Teachers' self-efficacy in turn proved to be a significant predictor of teachers' willingness to inclusive education.

The Promotion of Pre-Service Teachers' Team-Teaching Competencies for Inclusive Education

Keywords: In-service Teacher Education, Primary Education, Self-efficacy, Teacher Professional Development

Presenting Author:Frank Hellmich, Paderborn University, Germany; **Co-Author:**Jan R. Schulze, Paderborn University, Germany; **Co-Author:**Fabian Hoya, Paderborn University, Germany

With the ratification of the UN-Convention on the Rights of Persons with Disabilities, there are numerous questions concerning the implementation of inclusive learning processes in primary school. One important question concerns the enhancement of pre-service teachers' competencies for inclusive learning in schools. In particular, the collaboration of primary school teachers and special needs teachers is regarded as an important prerequisite for children's successful learning processes. Currently, it is not yet fully clear how pre-service teachers can be successfully prepared for team-teaching in inclusive classrooms and how their self-efficacy beliefs regarding inclusive education can be positively influenced during their studies. In our study, we therefore designed a concept to foster pre-service teachers' team-teaching strategies in inclusive education. Additionally, we examined possibilities and limits of this concept on the basis of a quasi-experimental study. In our study, $N=156$ pre-service primary school teachers and pre-service special needs teachers from a university in Germany participated. The students of the experimental-group participated in a training on team-teaching strategies, whereas the students of the control-group did not receive any special support in this field. On the basis of pre- and post-questionnaires, we investigated whether the training significantly leads to positive changes in students' knowledge about team-teaching strategies and in their self-efficacy beliefs regarding inclusive education. The results of our study give evidence for an effect of the training on pre-service teachers' knowledge about team-teaching strategies in inclusive education. However, the training does not significantly influence pre-service teachers' self-efficacy beliefs.

Session V 17

26 August 2021 18:45 - 19:45

Session Room 15

Invited Symposium

SIG 17: Tidying the toolbox: trials, tribulations and triumphs in research on learning and education

Keywords: E-Learning/Online Learning, Ethnography, Informal Learning, Lifelong Learning, Mixed-method Research, Qualitative Methods, Quantitative Methods, Researcher Education, Social Interaction, Workplace Learning

Interest group: SIG 17 - Methods in Learning Research

Chairperson: Dominik E. Froehlich, University of Vienna, Austria

Organiser: Marc Sarazin, University of Edinburgh, United Kingdom

Discussant: Jasperina Brouwer, University of Groningen, Netherlands

Published papers often seem to have research designs and methods that are ideally suited to their studies. Yet, research rarely happens with perfectly executed methods or starts out with optimal designs. Instead, it is littered with dashed hopes, rusty tools, and challenges that are met and bested. This SIG 17 Invited Symposium at EARLI 2021 seeks to enable open discussions about what happens when the best-laid plans of researchers in learning and education meet reality. The symposium will aim to open up the research process: which methods worked out, which ones proved wanting, and what did we learn when we used them? Which designs did we attempt, and how could we improve designs for future studies? What advice would we give to junior or senior colleagues who might want to use similar methods or designs in future?

Symposium papers address the above aims by adopting a conceptual, methodological, and/or empirical lens on research methods. They will contribute to nascent discussions across the scientific community about what 'goes on' in research. They will also seek to elucidate some methods for avoiding common pitfalls, for making the best of difficult situations, and for actively integrating experimentation and 'failure' into research designs. In doing so, the symposium papers will assist junior and senior educational researchers not only in their day-to-day work, but also in making their research as relevant as possible for real-world educational settings.

Lessons Learnt From Research in Learning Transfer Around Participant Mortality

Presenting Author:Aitana González Ortiz de Zárate, Udima (Madrid Open University), Spain; **Co-Author:**Carla Quesada-Pallarès, Universitat Autònoma de Barcelona, Spain

Recent studies in learning transfer appear to be using the same approach, measuring transfer through cross-sectional designs. Though, few studies have examined transfer -and the factors that influence transfer- through longitudinal lens, having pointed at the high drop-out rate as one of the main reasons. This study aimed at discussing challenges related to the measurement of learning transfer and transfer factors by analyzing participant mortality rates on three studies that measured transfer quantitatively from a longitudinal perspective. Descriptive analyses showed examples of two studies with acceptable response rates, and one study with low response rates. Research investigating participant retention strategies as applied in other areas is encouraged. Discussion around the pertinence of the questions, designs, and measures are provided, and a call for challenging latent consensus is made. Results are relevant to the domain of adult learning in work settings.

Mixing theories and its implications for mixing methods

Presenting Author:Victoria Murphy, Open University, United Kingdom; **Co-Author:**Debbie Vermond, University Medical Center Utrecht, Netherlands; **Co-**

Author: Esther de Groot, UMC Utrecht, Netherlands

Mixed methods is often understood as mixing different types of data. We argue that, before thinking about mixing different types of data, there is often a need to think about mixing underpinning theoretical approaches. Theoretical triangulation has been promoted as a way to increase research vigour and can allow the exploration of your data from multiple perspectives. If you don't use multiple theories, you risk being trapped by the limitations of a single theoretical approach. At the same time, mixing theories means risking poor integration of theories, inadequate interpretation of results or being misunderstood by funders or reviewers. Combining approaches from two different ideological or theoretical underpinnings has been considered both "enlightened eclecticism" and a "hazardous hotchpotch". Social network analysis (SNA) offers one example of a theory that may be "enlightened" by mixing, as a common critique is that SNA as a framework on its own is unable to explain why its findings are of importance.

This presentation will begin with a discussion of the connection between epistemology, theoretical frameworks, methodology, and methods. We will then draw upon our own successes and failures of mixing theories to illustrate both the advantages and pitfalls of mixing theories. In particular, the combination of SNA and activity theory will be used as an elaborated example to demonstrate how mixing at the theoretical level has implications for methodology and methods. The session will end with guidelines on how to mix theories well, using terminology from the broader topic of mixed methods.

Embracing experimentation: a pragmatist approach to participant engagement in mixed methods studies

Presenting Author: Marc Sarazin, University of Edinburgh, United Kingdom

Scholarship relating to mixed methods (MM) data collection has largely revolved around how qualitative and quantitative data can be combined, and the usefulness and suitability of such combinations for different kinds of research questions. Meanwhile, published studies leave the impression that MM research designs are implemented without problem. Yet, underlying MM data collection is an inherent tension resulting from differences in engagement with participants. While qualitative methods often pre-suppose that data is mutually constituted and negotiated by researchers and participants, quantitative methods typically imply a view of data as 'sampled' or even 'scraped' from people after superficial (or non-existent) engagement. The tension between both forms of engagement can threaten data quality, hinder data collection, and lead to ethical quandaries.

The present paper will offer a framework for engaging with participants during MM data collection that goes back to the epistemological roots of mixed methods —pragmatism. The paper argues that researchers' engagement with participants is an inherent and non-trivial part of MM research designs, and argues for an approach to engagement in which experimentation and social interaction take centre-stage. It illustrates this approach by discussing an MM ethnographic study undertaken with children experiencing schooling difficulties—a research design and group of participants where engagement is as vital as it can be fraught. It presents the initial trials and tribulations encountered in the study surrounding engagement with participants, the rationale behind the study's final pragmatic and relational approach to engagement, and the substantive findings that were uncovered thanks to this approach.

Session W 1

27 August 2021 09:00 - 10:00

Session Room 8

Invited Symposium

Developmental Aspects of Instruction

SIG 21: Beyond the pandemic: Shaping of futures in (even more?) diverse educational settings

Keywords: Artificial Intelligence, Cultural Diversity in School, Developmental Processes, E-Learning/Online Learning, Instructional Design, Learning Approaches, Mixed-method Research, Motivation and Emotion, Multicultural Education, Qualitative Methods, Social Aspects of Learning and Teaching, Technology, Workplace Learning

Interest group: SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Sylvi Vigmo, University of Gothenburg, Sweden

Organiser: Becky Bergman, Chalmers University of Technology, Sweden

Discussant: Charles Max, University of Luxembourg, Luxembourg

Looking at SIG 21's mission statement, the diversity of learning and education (which is / was ?) a granted element in educational research, seems to hail from a post/past century, where *not* everyone was doing learning *online*, remotely via the *same* tools and devices (i.e. zoom, etc.) Therefore, we wonder if the diversity still can be looked at in similar ways, and if so, which other ways of looking at the « new normal » should be developed, both from a practical, empirical research point of view, but also from a theoretical and epistemic perspective, underlying *new* research (or research into the *new* normal). Following this first line of thought, which questions could determine future research into education, educational settings and learning as such? This seems of particular interest, as the current ways of looking into education are heavily biased by concerns of technological infrastructure, investment and structural fitness (i.e., teachers as app-experts, networks, online setups, disregarding actual learners). Moreover, other ways of looking into formerly accepted « groups » (i.e., gender, age, background) seem to fall apart and disintegrate, making the issue of heterogeneity even more challenging to grapple with. Finally, when looking at the landscape of educational contexts and their societal anchorage at large (i.e., learning settings, formal/informal settings, mobility, development of professionals ...) one aspect seems of particular interest: Is there learning in and from the actual situation? How sustainable are the developments? Which perspectives can be drawn beyond the short term?

Face(ing) learning: who am I learning with?

Presenting Author: Natalia Durus, Luxembourg multi-LEARN Institute asbl, Luxembourg

The 2020 pandemic has impacted students and teachers in different ways, two obvious changes being the locus of learning and the partners for learning. The current research documents and analyzes the experiences of kindergarten, primary and secondary school teachers in Romania who are also class or school responsible. A secondary data set includes volunteers who have been assisting students from vulnerable contexts with online schooling. The data comprises both interviews realized by local televisions and available online and interviews collected for the purposes of this research with teachers active in public and private schools. We envisage the collection, transcription and analysis of a total of 20 interviews, geographically spread. Schools management, teachers and students have been faced with a certain autonomy of decisions, in a redefinition of the microcommunity of learning. If until recently, the schools' management was referring to the local inspectorates for all the managerial decisions, now the schools are expected to analyze the situation and take decisions locally. Teachers find themselves in a new paradigm, and it's up to each one of them to redefine learning in this online context. Students have to learn to juggle between two contexts: the familial context and the online school context. The first results of the analysis show an opportunity for reconceptualizing the face of learning, by moving the focus from "what is learned" to "who am I learning with", a change in the entry point of how learning is conceptualized.

Changing learning and development in organizations from past-focused to future-focused

Presenting Author: Natalia Durus, Luxembourg multi-LEARN Institute asbl, Luxembourg; **Co-Author:** Florian Feltes, XU Exponential University, Germany

Currently, employees are usually selected according to their skills and the development paths are also strongly influenced by the past. In the rarest of cases, employees are developed with a view to the future and their preferred contribution opportunities. In the future, the focus must be much more on how talents are diagnosed in a future-oriented manner and enabled to develop themselves further. The Zortify approach suggests to have a positive impact on the speed and quality of innovation teams as well as on the individual performance and well-being. Zortify collaborates with an DAX 30 enterprise with the objective to develop and implement a software solution and process that enables agile and innovative Tec organizations to gain in speed and quality.

From survival mode to conceptualising a/the « new normal » in educational settings

Presenting Author: Gudrun Ziegler, Luxembourg multi-LEARN Institute, France

As many programmes on all levels – be it primary, secondary and higher education – had (and still have to) to react in a first (and then second, maybe third ..) state of emergency, adopting a « crisis » or « survival » mode, navigating on a week-to-week or even day-to-day mode, struggling with loss or unavailability of

resources (due to quarantined personnel, lack of technology or replacement tools), the focus shifts in the now second year of the pandemic towards the broader impact of the change(s) in educational (systemic) activity, focussing and reconsidering – objectifs, challenges and key domains of (the projected/wanted) learning and development. This paper limits its scope, relying on a mixed method approach integrating interview data with teachers, student online dairies, interaction analysis, to four selected settings from the global north (a Masters programme from a University in France, a secondary school in Luxembourg, a primary classroom within the European Schools, a Chinese language school operating in France from Singapour), in order to hopefully / ideally grasp core insights into what a sustainable « new normal » might have to consider in order to leave the « crisis » mode and to move on to valuable (eventually enriched and not impoverished) educational set-ups.

Session W 2

27 August 2021 09:00 - 10:00

Session Room 14

Invited Symposium

Assessment and Evaluation

EFG: Learner-Centered Processes in Feedback Across Contexts: Theoretical and Empirical Findings

Keywords: Achievement, Assessment Methods and Tools, Cognitive Skills, E-Learning/Online Learning, Educational Attainment, Educational Psychology, Experimental Studies, Higher Education, Mixed-method Research, Peer Interaction, Quantitative Methods, Reasoning

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Anastasiya Lipnevich, The Graduate Center of the City University of New York, United States

Chairperson: Naomi Winstone, University of Surrey, United Kingdom

Discussant: Robert Nash, Aston University, United Kingdom

The objective of this symposium is to synthesize recent research and present empirical evidence explaining mechanisms that underly individuals' effective processing of feedback. This session will bring together an international team of leading experts in the field who will share current empirical studies and theoretical overviews of different contingencies that facilitate students' uptake of feedback. Scholars from the US, UK, Belgium, Netherlands, and Poland will discuss processing of feedback in different contexts, using a variety of methods, offering avenues for future research and suggesting ways for practical implementation. The session will be structured in the following way. First, a theoretical overview of methods will be presented. Further, three papers will report results of empirical investigations, describing various aspects of feedback processing. Finally, the discussant, who is one of the leading experts in the field, will present a synthesis and offer suggestions for moving the field forward.

How do learners process and use feedback? A systematic review of research using online measures

Presenting Author:Florence Van Meenen, UCLouvain, Belgium; **Co-Author:**Nicolas Masson, Université catholique de Louvain (UCL), Belgium; **Co-Author:**Liesje Coertjens, Université catholique de Louvain (UCL), Belgium

Up to present, only a limited number of studies have investigated how learners process and use the feedback they receive. Two literature reviews have looked into this research topic. The first, by Jonsson (2013), focused on higher education students' use of teacher feedback. The second, carried out by Winstone and colleagues (2017), aimed to understand learners' engagement with feedback in all education levels. Yet, the use of feedback has gained interest among researchers in recent years. Moreover, online measurements are increasingly relied upon to better capture the conscious or unconscious processing activities involved in feedback processing and feedback use. Hence, an updated view on the state of literature on how learners process and use feedback, and of the gaps and directions for future research is timely. The aims of this systematic literature review are twofold: (1) *Which study designs and online measures are used in studies on the processing feedback by learners?* (2) *Which strategies do learners use to deal with feedback and what are the factors that promote or impede its use?* We have collected all empirical studies published between the beginning of 2014 and the end of 2020 in Scopus, PsycINFO and ERIC. 3295 peer-reviewed articles were retrieved. After a first sorting based on the screening of titles, abstracts and keywords, 126 articles were retained. The next steps in this research include screening the full texts and conducting a reference-mining search. **Keywords:** assessment, methods and tool and meta-analysis

Effects of error tolerance, feedback tolerance, and perceived expertise on peer feedback processing

Presenting Author:Jochem Aben, University of Groningen, Netherlands; **Co-Author:**Anneke Timmermans, University of Groningen, Netherlands; **Co-Author:**Mayra Mascareño Lara, University of Groningen, Netherlands; **Co-Author:**Filitsa Dingyldou, University of Groningen, Netherlands; **Co-Author:**Jan-Willem Strijbos, University of Groningen, Netherlands

Processing peer feedback can be affected by numerous interacting factors such as personal characteristics and interpersonal perceptions. The current study aims to contribute to the understanding of how this multitude of factors may affect feedback processing, by focusing on how (1) error tolerance (i.e., resilience towards errors), (2) feedback tolerance (resilience towards feedback), and (3) the perception of the feedback provider's expertise as reflected by their language skills relate to textual revisions while processing peer feedback. Students received feedback on their written text, and they were led to believe this feedback was provided by one of their peers who they had previously assessed as a classmate with either stronger or weaker language skills compared to themselves. In reality, all students processed similar feedback provided by the researchers. The results showed that error tolerance and feedback tolerance did not affect text revisions. Simultaneously, the perception of the feedback provider's expertise (language skills) significantly affected textual revisions based on feedback regarding writing style: students revised their text more often in line with the feedback when they thought the feedback was provided by a perceived stronger peer than when they thought the feedback was provided by a perceived weaker peer. The perception of the provider's expertise did not affect textual revisions based on feedback regarding spelling, grammar, and higher order concerns. As such, students seemed to be partly guided in their decision to act upon the feedback on writing style by their perception of the feedback provider's language skills.

The eye-mind of processing feedback: Unravelling how students read and use feedback for revision

Presenting Author:Renske Bouwer, Utrecht University, Netherlands; **Co-Author:**Kim Dirkx, Open University, Netherlands

Feedback is one of the most powerful instructional tools. But how do students process and use teacher feedback to improve their writing? In two studies we investigated feedback processing strategies of university students using a combination of online and offline measures. Study 1 explored how sixteen premaster students read and use teacher feedback for revision. Results showed three feedback processing strategies: superficial, local or global. Students who processed feedback superficially ($n = 6$) read all the feedback, but in a linear way and without critically rereading or revising the text. Students with a local feedback processing strategy ($n = 6$) went back and forth between the comments and their text, while students with a global processing strategy ($n = 4$) looked at both commented and uncommented parts of the text and made more substantial revisions. In study 2, a total of 47 students received a student text of average quality with feedback provided either as comments or as a combination of comments and in-text changes. The same feedback processing strategies were found as in study 1. Students were also more likely to revise when feedback was only provided in comments, rather than as a combination of comments and in-text changes. This suggests that students' feedback processing strategies can be affected by characteristics of the feedback. In conclusion, by integrating various process measures, these two studies provide novel insights on how students process teacher feedback and use it for revision. Implications of the findings for effective feedback will be discussed.

Says Who?: Credibility Effects in Self-verification Strivings

Presenting Author:Ewa Szumowska, Jagiellonian University, Poland; **Co-Author:**Natalia Wójcik, Jagiellonian University, Poland; **Co-Author:**Paulina Szved, Jagiellonian University, Poland; **Co-Author:**Arie Kruglanski, University of Maryland, United States

Research shows that people prefer self-consistent over self-discrepant feedback – the self-verification effect (Swann, 1983, 2012). It is not clear, however, whether the effect stems from the striving for self-confirmation or from preference for subjectively accurate information. In the current investigation, we argued that people self-verify because they find self-consistent feedback more accurate than self-discrepant feedback. We run two pre-registered studies in which we invited pre-selected participants with positive and negative self-views. In the laboratory, we presented participants with positive and negative feedback and

tested their feedback preference and choice. Importantly, we additionally manipulated credibility of the inconsistent feedback by providing information on its source: participants were told that the feedback came from a student in the control condition (moderately credible source) or from an experienced psychologist in the experimental condition (highly credible source). In line with our expectations, it turned out that people self-verified only in the control condition. So, in this condition participants with positive self-views preferred positive feedback over negative one, whereas participants with negative self-views preferred negative feedback over positive one. In the experimental condition, however, the self-verification effect disappeared (or reversed for participants with negative self-views in Study 1). Additionally, results of Study 2 showed that also individual differences in credibility, or epistemic authority ascribed to the self and the source of inconsistent information matter for feedback selection. The findings suggest that this is feedback credibility, rather than self-conformation, that underlies the preference for self-consistent feedback.

Session W 3

27 August 2021 09:00 - 10:00

Session Room 12

Invited Symposium

Instructional Design

SIG 6: The impact of different educational technology designs on learning in work-related contexts

Keywords: Educational Psychology, Educational Technology, Game-based Learning, Instructional Design, Learning Technologies, Multimedia Learning, Teaching/Instruction, Vocational Education

Interest group: SIG 06 - Instructional Design

Chairperson: Alberto Cattaneo, Swiss Federal Institute for Vocational Education and Training, Switzerland

Organiser: Alberto Cattaneo, Swiss Federal Institute for Vocational Education and Training, Switzerland

Organiser: Martin Merkt, Germany

Organiser: Moritz Sahlender, Germany

Discussant: Essi Ryymin, Häme University of Applied Sciences, Finland

Innovative educational technologies transform education, both in school and extra-school contexts. However, to make best use of technology, it is important to understand how different ways of designing educational scenarios integrating technologies affect learning. In this regard, instructional design research may be informative for educators and software designers that implement these technologies in educational and training contexts. In this symposium, we will have four contributions that address how these interventions including technologies such as serious games and virtual reality (VR) should be designed in order to optimize learning outcomes in work-related contexts. Across the presentations, the perspective will broaden in terms of the considered perspective (learners and teachers) and of digital tools (VR, game-based learning, and various technologies). In particular, Contribution 1 addresses the effects of signalling and feedback when using virtual reality to learn forest ecosystem; Contribution 2 investigates the effects of combining paper and virtual reality to learn garden design issues; Contribution 3 analyzes the effects of game-based learning on financial literacy development, whereas Contribution 4 takes a broad perspective in identifying teachers' instructional goals when using digital technologies to favor learning across school- and work-based contexts. The symposium offers new insights that help to develop theory-based approaches to further enhance learning with innovative digital technologies in applied settings, giving concrete hints to researchers, educators, and software designers. The discussant will wrap-up the main learnings of the individual contributions considering the potential of transfer of these findings to practice in different vocational fields.

The effect of signaling and feedback in learning forest ecosystems in Immersive Virtual Reality

Presenting Author: Jean-Michel Boucheix, University of Dijon, LEAD-CNRS, France; **Co-Author:** Porte Laurie, Lead - CNRS / Université de Bourgogne, France; **Co-Author:** Louis Rapet, Arts et Métiers, Institute of Technology, LISPE, HESAM, University of Bourgogne Franche-Comté, Chalon sur Saône, France; **Co-Author:** Benoit Haigre, LEAD-CNRS, University of Bourgogne Franche-Comté, Dijon, France; **Co-Author:** Jean-Luc Martinez, Arts et Métiers, Institute of Technology, LISPE, HESAM, University of Bourgogne Franche-Comté, Chalon sur Saône, France

The goal of the present study was to test the effect of signaling associated with feedback in learning about forest ecosystems in the context of a realistic living forest simulator, in Immersive Virtual Reality (IVR) conditions for students in agriculture. Two signaling modalities were investigated: visual flashing of forest elements (tree species, plants, flowers, wet-areas etc.) and tags, both with text in pop-up windows, in a 2x2 experimental plan. One hundred pupils of an agricultural technological high school had to explore (including physically), select and mark (using the joysticks) relevant elements of the forest in three living forest areas (visually delimited inside of a broader forest area) in order to choose the best area, among the three, in which an equipped public-tourist reception site (picnic, resting, reception site) could be built. The chosen site must have the least possible negative impact on the ecosystem of the forest and its development over time. After their decision, students were provided feedback with a series of VR desktop multimedia slides showing the effect of this choice on the ecosystem of the chosen area. After the feedback, they had to decide and justify again whether they would change or maintain their first decision. Results showed significant positive effects of the signaling modalities, visual flashing for selecting and both tags and flashing for decision performances; and of the feedback on the correct decision answers. The combination of signaling and feedback seemed to enhance the activation, and retrieval from memory, of the task-relevant concepts.

Garden designing in virtual reality for apprentice gardeners in vocational education

Presenting Author: Kevin Gonyop Kim, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland; **Co-Author:** Martin Dobricki, Bern University of Teacher Education, SFIVET, Switzerland; **Co-Author:** Richard Lee Davis, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland; **Co-Author:** Pierre Dillenbourg, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland

In this study, we explored the use of virtual reality (VR) for the training of apprentice gardeners in vocational education.. Using a 2x2 crossover design with apprentice gardeners from Swiss vocational schools, we investigated how using a VR garden-design application affected the quality of the designs that the students created when compared to students who used a conventional paper-sketching interface. Our results showed that the VR interface had distinct advantages when compared to the paper interface in terms of different aspects of the design quality. Moreover, the order between the two interfaces had a significant effect on the design quality. Students who used the paper interface before the VR interface produced higher-quality designs than students who used the VR interface before the paper interface. Our findings suggest that the strength of VR in a designing task for vocational education can be complementary to that of the conventional paper-based practice and the order between the two can play an important role in terms of the learning outcome.

Integrative design and development of a digital game and game-based learning in financial education

Presenting Author: Carmela Aprea, University of Mannheim, Germany; **Co-Author:** Julia Schultheis, University of Mannheim, Germany

Given recent societal and economic trends, financial literacy (i.e. the ability to reasonably deal with money and financial matters) has become a pivotal concern especially for adolescents and young adults. Whereas traditional financial education seems not to have the desired impact on financial behaviour formation and behavioural change, serious games could be considered more promising in this regard. However, to realise their full potential, serious games and game-based learning needs to consider (at least) three integrative aspects, namely: (1) The integration of the domain with the learners' cognitive and motivational processes by configuring elements of game design. (2) The integration of the educational context in which they are to function, including requirements of learners and other stakeholders. (3) The integration of game-based learning experience (procedural knowledge) with more formalised and abstract learning contents (conceptual knowledge). In this paper, we present three types of studies (i.e. a developmental study, case studies and an experimental study) each of which addresses one of these aspects. These studies yielded the following results: (1) the financial education serious game "FinanceMission Heroes"; (2) a number of guidelines for implementing this financial education serious game into educational contexts, and (3) effective conceptual scaffolds that help students to understand, apply and transfer the concept of budgeting, which is the core of the game. The findings of our project support the claim that a well-designed and integrated serious game can foster learning and motivation in financial education.

Teachers' experiences of designing for digital learning across boundaries in vocational education

Presenting Author:Ann-Britt Enochsson, Karlstad University, Sweden; **Co-Author:**Nina Kilbrink, Karlstad University, Sweden; **Co-Author:**Annelie Andersen, Department of Educational Studies, Karlstad University, Sweden; **Co-Author:**Annica Ådefors, Karlstad university, Sweden

The use of digital technology is becoming a more and more central part of education at all levels and pathways. This is also the case in vocational education conducted in dual systems. In dual systems, students can perceive a gap between the different learning arenas school and workplaces, and the use of digital technology as bridging tools, or boundary objects (cf. Akkerman & Bakker, 2011) can be a way to facilitate boundary crossing in relation to different pedagogical aims. In this paper, we deepen the discussion of the importance of defining the pedagogical aim in relation to which gap to bridge and then choosing a suitable technology in this context. Data for this study consist of written and oral narratives from in-service teachers as well as preservice teachers in Swedish upper secondary education, about their experiences of using digital technology as boundary objects in vocational education. Their narratives have been analysed based on a model developed in previous studies on digital technology as boundary objects in vocational education. The results show how different kinds of technology can support different kinds of pedagogical aims and we will present different empirical examples from the narratives.

Session W 4

27 August 2021 09:00 - 10:00

Session Room 17

Symposium

Higher Education, Learning and Social Interaction, Motivational, Social and Affective Processes

Teacher expectation stability and moderators of teacher expectation effects

Keywords: Cognitive Skills, Cultural Diversity in School, Higher Education, Mathematics, Motivation, Motivation and Emotion, Parental Involvement in Learning, Primary Education, Quantitative Methods, Secondary Education, Social Aspects of Learning and Teaching, Social Interaction, Teaching/Instruction

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Ineke Pit-ten Cate, University of Luxembourg, Luxembourg

Organiser: Anneke Timmermans, University of Groningen, Netherlands

Discussant: Ineke Pit-ten Cate, University of Luxembourg, Luxembourg

Teacher expectations guide behaviour during instruction, and form a basis for student support, grouping, and choice of learning material. Accurate to high expectations are favourable for adaptive instruction and can positively affect future student achievement. In this symposium we present and discuss four papers related to two relatively recent trends in teacher expectation research (Figure 1). These trends include:1) The stability of expectations over the course of a school year (Papers 1 and 2), 2) The search for moderators of teacher expectation effects (Papers 3 and 4). A degree of stability of teacher expectations is assumed as a precondition to generate effects on student performance. However, the extent to which teachers are able to adapt their original perceptions is largely overlooked in empirical research. Papers 1 and 2 both present longitudinal studies on stability of expectations at various levels (within-students, between-students, and between-classes). Although, a long-held assumption that expectations do not necessarily impact all students to the same extent, few studies have empirically tested whether stigmatised student groups (e.g., girls in mathematics and minority group students) are more vulnerable to self-fulfilling prophecies than other students. Papers 3 and 4 of this symposium expand the current body of knowledge by testing whether teacher expectations have similar effects on study choice, academic performance, and socio-psychological outcomes for various student groups. The four empirical studies, that were carried out in three different countries, investigate primary school teachers and their students and predominantly used longitudinal designs and elaborated regression methods.

The stability and trajectories of teacher expectations in Chinese junior high schools

Presenting Author:Shengnan Wang, The University of Auckland, New Zealand; **Co-Author:**Christine Rubie-Davies, University of Auckland, New Zealand; **Co-Author:**Kane Meissel, University of Auckland, New Zealand

Using three time points of teacher expectation data, this study aimed to examine the stability and trajectories of teacher expectations within a school year in the Chinese junior high school context. The participants were 48 Chinese, mathematics, and English teachers and their 1199 students from 10 junior high schools. The issue of the stability of teacher expectations was explored at the individual-student level and student-group level, respectively. Spearman's rank-order correlation analysis showed that the stability of individual-student-level teacher expectations varied across different classrooms, ranging from very flexible to very stable. Piece-wise hierarchical linear models indicated that the trajectories of teacher expectations across a school year were different for different-achieving student groups. Students in the high-achieving group were systematically overestimated, and the extent of overestimation increased over a school year for the Chinese and mathematics subjects, whereas students in the low-achieving group were systematically underestimated across the school year. The results suggested that teachers might enhance, or even exacerbate existing achievement differences between students by expecting more from high achievers and expecting unjustifiably less from low achievers.

Adjusting expectations or maintaining first impressions? The stability of teachers' expectations

Presenting Author:Anneke Timmermans, University of Groningen, Netherlands; **Co-Author:**Christine Rubie-Davies, University of Auckland, New Zealand; **Co-Author:**Shengnan Wang, The University of Auckland, New Zealand

The issue of teacher expectation stability is crucial in understanding the self-fulfilling prophecies generated by teacher expectations but is hampered by a lack of empirical evidence. The aim of the current study was to assess the temporal stability of teacher expectations within the timeframe of one school year by separating the within-student processes from stable between-student differences. Random-Intercept Cross-Lagged Panel Models were employed based on a sample of 2,536 students taught by 89 teachers in New Zealand public elementary and middle schools. The rank order of students based on the teachers' expectations remained rather stable. Nevertheless, some degree of expectation instability was present at the within-student level. A reciprocal relationship between expectations and achievement was found consistent with the hypothesis of adaptive expectations. Paths from student mathematics achievement to teacher expectations were directionally dominant, indicating that teachers adapted their expectations for students to fall in line with student performance and continued to do so throughout the year. The gap between performance and expectations closed at a decreasing rate; fast at first and slower as the expectations became more in line with performance, thereby limiting the potential for self-fulfilling prophecy effects later on in the school year.

Gender and minority status as moderators of teacher expectation effects

Presenting Author:Christine Rubie-Davies, University of Auckland, New Zealand; **Co-Author:**Anneke Timmermans, University of Groningen, Netherlands

Although assumed, whether stigmatised groups are more vulnerable to teacher expectation effects than other students is relatively unknown. This study examined whether gender or minority status were moderators of teacher expectation effects for mathematics achievement and self-concept and motivation (interest and utility value). Among a sample of 54 teachers and 1663 Year 7 and 8 students in New Zealand, mathematics achievement, gender (higher for girls) and ethnicity (higher for Asian and lower for Māori compared with NZ European) predicted teacher expectations. Controlling for beginning-year variables and student background, teacher expectations were the only significant predictors of mathematics achievement and self-concept at the year's end. The addition of interactions to test moderation showed teacher expectations for NZ European boys positively predicted self-concept, whereas this association for Asian students was slightly negative. With regard to predicting interest in mathematics, the association for girls with teacher expectations was negative whereas the association between expectations and interest was positive for Pasifika students. Overall, this study showed that stereotypical beliefs appeared to be related to teachers' expectations and predicted achievement. Further, expectations moderated both student achievement and socio-psychological variables (self-concept and interest in mathematics).

Why do females prefer humanities, while males choose to study technology?

Presenting Author:Slawomir Trusz, Pedagogical University of Cracow, Poland

The presentation will attempt to answer the question: Why do females opt for humanities or social sciences (H/SS) whereas males prefer technology or science

(T/S). For this aim, the author will present the results of two cross-sectional studies. In the first one, the study majors selected by 445 females and 431 males were linked by logit functions with parents' and teachers' expectancies, students' self-expectancies, their self-concepts of abilities, time spent on learning mathematics/literacy, and test results in mathematics/literacy. In the second, just planned study, the mathematics and literacy anxiety characteristics will be added to the abovementioned predictors. Females' selections were mostly influenced by teachers' expectancies, self-expectancies, and results of the high-school final test in mathematics, whereas for males selections were influenced by self-concept, results of the high-school final test in mathematics, and time spent learning mathematics (Study #1). The links between mathematics/literacy anxiety and intrapersonal/interpersonal predictors of study majors' preferences will be quantified and analysed (Study #2). The findings will be discussed on the grounds of the theory of intra- and interpersonal expectancies as learning regulators.

Session W 5

27 August 2021 09:00 - 10:00

Session Room 1

Single Paper

Assessment and Evaluation, Teaching and Teacher Education

Achievement and Motivation

Keywords: Achievement, Emotion and Affect, Motivation, Student Learning, Teacher Effectiveness, Teaching/Instruction

Interest group: SIG 01 - Assessment and Evaluation, SIG 08 - Motivation and Emotion, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Peter Edelsbrunner, ETH Zurich, Switzerland

Learning activities as mediators between teaching quality and student outcomes: A systematic review

Keywords: Achievement, Motivation, Student Learning, Teacher Effectiveness

Presenting Author: Ayşenur Alp Christ, Institute of Education, University of Zurich, Switzerland; **Co-Author:** Vanda Sieber, Institute of Education, University of Zurich, Switzerland; **Co-Author:** Urs W. Grob, University of Zurich, Switzerland; **Co-Author:** Anna-Katharina Praetorius, Institut für Erziehungswissenschaft, Switzerland

Influential theoretical models (e.g., the opportunity-use model, Helmke, 2012) focus on the constructivist idea that teaching quality affects student motivation and achievement via students' learning activities. However, learning activities have been defined and operationalized differently in the literature. Consequently, the current situation in research is characterized by high complexity, diversity, and a lack of common language. Clarification of what exactly constitutes learning activities and their mediating role in this relation is necessary. In order to close this research gap, the present systematic review first aimed to identify conceptualizations and operationalizations of learning activities, and second aimed to summarize the mediating role of learning activities in this relation. The results showed that mostly motivation and engagement related learning activities were assessed as mediators. Learning activities were mostly measured by students' self-reports besides observer ratings and teacher perceptions. The results identified 39 statistically significant (44%) and 46 statistically non-significant mediating effects (53%) out of total 88 mediation paths in 27 quantitative studies. For three paths (3%) mediation analysis was not conducted. Whereas this review is the first to give a comprehensive summary of mediation studies in the field, future reviews should examine the mediation paths of the specific dimensions of teaching quality in more depth.

Cognitive and Affective-Motivational Effects of Computer-Based Knowledge of Results Feedback

Keywords: Achievement, Emotion and Affect, Motivation, Student Learning

Presenting Author: Livia Kuklick, IPN - Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:** Marlit A. Lindner, IPN - Leibniz Institute for Science and Mathematics Education, Germany

Little is known about the cognitive and the affective-motivational effects of automated computer-based feedback. Feedback may avoid students from forming misconceptions after exposure to multiple-choice (MC) lures, for example in low-stakes assessments without feedback, and foster students' test-taking motivation, by reflecting that their answers matter. In this classroom-experiment with $N = 661$ fifth and sixth grade schoolchildren, we varied the presence and the delivery mode of immediate *Knowledge of Results* (KR) feedback in a between-subjects design (i.e., no feedback vs. text, sound, color, or animation feedback). First, students worked on an 18-item multiple-choice treatment test (with the experimental feedback manipulation), while they repeatedly rated their motivational effort, enjoyment, pride and boredom (i.e., achievement emotions), as well as their expectancy of success, attainment value, and interest (i.e., facets of achievement motivation) before and after the treatment test. Subsequently, they worked on an 18-item multiple-choice posttest (without feedback) that assessed recall and transfer learning. Providing KR feedback significantly increased students' recall improvement, while near learning transfer was unaffected. Feedback had a significant negative effect on attainment value, whereas significant *feedback × treatment performance* interactions revealed that the effects on facets of the affective-motivational outcomes (i.e., expectancy of success, enjoyment, pride, and boredom) were moderated by performance. Feedback was motivating and emotionally beneficial for high-performing students, but showed negative effects on some affective-motivational outcomes for low-performing students. We further found that the delivery mode of KR feedback (i.e., verbal, nonverbal) hardly modified the effects in this study.

East meets West: Teaching motivation, instructional quality and academic achievers

Keywords: Achievement, Motivation, Teacher Effectiveness, Teaching/Instruction

Presenting Author: XIN LIU, Ghent University, Belgium; **Co-Author:** Ming Tang, Ghent University / Sichuan Normal University, Belgium

The study aims to provide new evidence of teacher motivation, instructional quality and their relations to academic achievers based on a similar cultural background between Confucian and Nordic countries/regions using TALIS 2018 data. Confirmatory factor analysis was applied to examine the dimensionality of teaching motivation (i.e. personal utility motivation to teach, social utility motivation to teach, teachers' perceptions of value and policy influence) and instructional quality (i.e. clarity of instruction, cognitive activation, classroom management). By testing the measurement invariance, the factor structure reached to the metric invariance across ten countries. Path analysis was used to examine the relationships between predictors and outcome variables. The results showed that no same pattern structure existed in any two countries, but common some features were found. In Confucian and Nordic countries/regions, social utility motivation can promote teaching quality more than personal utility motivation. *Clarity of instruction* had no impact on academic achievers, but *classroom management* positively contributed to achievement in ten countries/regions. *Cognitive activation* was positively associated with Norway's educational outcome but no correlation in Japan, while the negative associations in other countries/regions. Although plenty of studies state the *clarity of instruction* positively affects student achievement, no relation is found in these ten countries from TALIS 2018.

Keywords: teaching motivation, instructional quality, measurement invariance, Confucian and Nordic countries/regions, academic achievers

Session W 6

27 August 2021 09:00 - 10:00

Session Room 10

Single Paper

Instructional Design

Writing in Secondary Education

Keywords: Citizenship Education, Design-based Research, History, Instructional Design, Secondary Education, Writing/Literacy

Interest group: SIG 12 - Writing

Chairperson: Tuike Iiskala, University of Turku, Finland

The Effects of a Reading-to-Write Instruction in History

Keywords: History, Instructional Design, Secondary Education, Writing/Literacy

Presenting Author:Johan van Driel, University of Amsterdam, Netherlands; **Co-Author:**Jannet van Drie, University of Amsterdam, Netherlands; **Co-Author:**Carla Van Boxtel, University of Amsterdam, Netherlands

In order to achieve historical understanding, students need to know how to read historical accounts and how to write historical arguments. Little is known how reading instruction helps students to write historical argumentation.In a randomised pre- post design, this study examined the effects of a reading to write instruction on (a) quality of written texts, (b) knowledge of reading historical accounts (c) knowledge of writing historical argumentation, and (d) knowledge of reasoning about historical significance. Results showed that students in the reading to write condition wrote significantly better essays compared to students who received a content-based instruction in particular with regard to the main paragraphs, coherence, involving perspectives, and historical context. In addition, they scored significantly higher on knowledge of reading than students in the content-based condition. No effects were found for knowledge of writing or knowledge regarding reasoning about historical significance. Self-reports on learning gains indicated that students in the reading to write condition were more aware of the interpretative nature of historical knowledge than students in the content-based condition.

Writing in Civic Education at lower secondary school: The Effects of an intervention?

Keywords: Citizenship Education, Instructional Design, Secondary Education, Writing/Literacy

Presenting Author:Claudia Forkarth, Universität Duisburg-Essen, Germany

The aim of this paper is to present the Genre Cycle (e.g. Taufik 2009, Callaghan & Rothery, 1988) as a writing-support-model, especially for domain specific writing in civic education (CE), and to measure its effects on students writing abilities and domain specific knowledge. The basic assumption of the study, integrated in the project SchriFT II is that through the production of domain specific types of texts, the epistemic function of language is developed, and students' academic language ability is strengthened as well as their subject related competences. Using a statistically relevant sample from the 7th and 8th grades in comprehensive schools in North Rhine-Westphalia, students' subject-specific writing abilities will be tested and compared with their abilities in civic education. For a quantitative study with pre-post-design around 280 students will be surveyed in civic education for general language competences (C Test), socio-economic status (SES), motivation & interest (questionnaire), as well as for political knowledge (competence test) and subject-specific writing skills (rating of writing samples on political issues). A qualitative intervention is developed, implemented and evaluated across a number of lessons. The research findings can be used on many levels in the realisation of an 'integrated language education', for example through the implementation of teaching and instructional frameworks for language learning through civic education or vice versa as well as through materials for all phases of teacher education and training (s.a. Manzel & Forkarth, 2020).

Synthesis writing in Science Orientation classes, a design study

Keywords: Design-based Research, Instructional Design, Secondary Education, Writing/Literacy

Presenting Author:Edith Alkema, RICDE / University of Amsterdam, Netherlands; **Co-Author:**Gert Rijlaarsdam, University of Amsterdam, Netherlands; **Co-Author:**Daphne van Weijen, University of Amsterdam, Netherlands

Abstract (247 words) In the Netherlands, synthesis texts, based on sources, are written in language classes as well as in subject classes. Therefore, improving students' synthesis writing skills is a task for both language and domain-specific teachers. A design experiment was carried out to improve students' performance on synthesis reading-writing tasks. 10th grade students (three intact classes, n=67) participated in a pretest-posttest design in which they wrote three syntheses: before, during and after the intervention. In addition, students filled in learner reports after each lesson to indicate what they had learnt. There was no control group. The instructional design was based on earlier studies and included four key learning activities: 1) constructing a task definition, 2) creating a 'question-based summary', 3) observing the teacher selecting and integrating arguments, and 4) providing and processing peerfeedback on a draft. Text quality was rated by two groups: language teachers and subject teachers. Raters used eight specific criteria - based on earlier research, varying from 'completeness of information', and 'completeness of integration', to 'style', and provided a 'global' score by comparing the text to a set of benchmark texts. Results showed that students' writing performance improved significantly, regardless of raters' discipline (language or other). Students' learner reports revealed that three key learning activities were rather effective, although there was room for improvement. The fourth learning activity, peerfeedback, however, was not effective, perhaps due to an overload of activities during this lesson. Students did provide peerfeedback but hardly used that feedback when revising their texts.

Session W 7

27 August 2021 09:00 - 10:00

Session Room 11

Single Paper

Cognitive Science, Learning and Instructional Technology, Learning and Social Interaction

Self-regulation

Keywords: Argumentation, Computer-supported Collaborative Learning, E-Learning/Online Learning, Higher Education, Inquiry Learning, Metacognition, Problem Solving, Reasoning, Self-regulation

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 16 - Metacognition

Chairperson: Sarah Howard, University of Wollongong, Australia

Exposing Cues for Cognitive Load Monitoring in Problem Solving

Keywords: Metacognition, Problem Solving, Reasoning, Self-regulation

Presenting Author:Yael Sidi, the Open University of Israel, Israel; **Co-Author:**Rakefet Ackerman, Technion - Israel Institute of Technology, Israel

It is well-established that metacognitive monitoring of performance (e.g., confidence in provided answers) is based on heuristic cues rather than on actual success in the task. In research inspired by the Cognitive Load Theory there is an extensive use of judgments of mental effort (JoME) with little delving into the processes that underlie them. The present study aimed to expose heuristic cues that underlie JoME in comparison to cues that underlie confidence judgments. Online participants were presented with a problem-solving task based on the Cognitive Reflection Test, which includes misleading math and logic problems, for which the first solution that commonly comes to mind is a wrong but predictable one, while deeper processing is required to recognize this error and come up with the correct answer. We compared four monitoring types: confidence, difficulty, and two types of JoME, judgments of data-driven and goal-driven effort. We also compared open-ended to multiple-choice test formats, for examining the consistency of cue use across test formats. Findings revealed that the two test formats do not differ in terms of the effects of accuracy and response time on the examined judgments. However, the monitoring process seems to differ in the main underlying cue: while confidence was correlated strongly with answer accuracy, all other ratings were strongly correlated with response time. The present study presents initial evidence for differential mechanisms underlying confidence ratings and JoME ratings. The findings deserve further delving into effort and difficulty monitoring, about which very little is known so far.

Effects of Video Modeling and Metacognitive Prompts on Scientific Reasoning and Self-Regulation

Keywords: Argumentation, Inquiry Learning, Reasoning, Self-regulation

Presenting Author:Yoana Omarkhevska, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany; **Co-Author:**Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany

Improving scientific reasoning is a fundamental aim of science education. One effective method to improve reasoning is to use guided inquiry learning. In this study, we investigated the effectiveness of combining video modeling (VM) and monitoring prompts (P) for improving university students' ($N = 127$) hypothesis and argumentation quality. We compared the hypothesis and argumentation quality of students who watched VM examples and received prompts to students who watched VM examples only and to students who engaged in unguided inquiry learning (control) prior to a training and a transfer task. Our findings showed

that video modeling examples improved hypothesis quality in a training and a transfer task. Argumentation quality improved in the training task, but not in the transfer task. No additional benefit from the prompts was observed. Furthermore, we analyzed process data from screen captures and think-aloud protocols during the two learning tasks to investigate how VM examples and monitoring prompts influenced scientific reasoning and self-regulation processes. We used epistemic network analysis (ENA) and process mining to model the sequences in which participants engaged in scientific reasoning and self-regulation processes. Results from ENA identified stronger temporal connections between scientific reasoning and self-regulation processes in the VM conditions compared to the control condition. Process mining results identified unique process models depicting the overall sequence of scientific reasoning and self-regulation processes in different conditions. Our findings indicate that VM examples are beneficial for improving scientific reasoning and self-regulation on the processes and learning outcome level.

Homogeneous Problem Perception, Immediacy and Intensity of Strategy Use in Online CSCL

Keywords: Computer-supported Collaborative Learning, E-Learning/Online Learning, Higher Education, Self-regulation

Presenting Author:Laura Spang, University of Augsburg, Germany; **Co-Author:**Martin Greisel, University of Augsburg, Germany; **Co-Author:**Markus Dresel, University of Augsburg, Germany; **Co-Author:**Ingo Kollar, University of Augsburg, Germany

During the pandemic, online CSCL has frequently been used to complement structured university courses and lectures. In such collaborative learning sessions, students have to cope with emerging challenges. Homogeneous problem perception in the learning group, immediacy of strategy choice and intensity of strategy execution might help to successfully regulate these problems. We investigated the kinds of regulation problems that occurred in 106 student groups in which N=222 students collaborated during a structured lecture assignment. Multilevel-regression indicated that homogeneous problem perception—contrary to immediacy of strategy choice and intensity of strategy execution—predicted self-perceived regulation success. Thus, during structured online CSCL, it seems to be more important to arrive at a joint perception of a problem than to apply immediate strategies at a high level of intensity. Therefore, students should be scaffolded to reach homogeneous problem perceptions within groups in order to increase regulation effectiveness.

Session W 8

27 August 2021 09:00 - 10:00

Session Room 13

Single Paper

Assessment and Evaluation

Cooperative and Collaborative Learning

Keywords: Assessment Methods and Tools, Case Studies, Cooperative/Collaborative Learning, Higher Education, Peer Interaction, Social Interaction

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Karolina Doulougeri, Eindhoven School of Education, Netherlands

Development and validation of the Collaborative Skills Questionnaire

Keywords: Assessment Methods and Tools, Cooperative/Collaborative Learning, Peer Interaction, Social Interaction

Presenting Author:Attila Pásztor, MTA-SZTE Research Group on the Development of Competencies, Hungary; **Co-Author:**Anita Pásztor-Kovács, Institute of Education University of Szeged, Hungary; **Co-Author:**Gyöngyver Molnar, University of Szeged, Hungary

The methodological issues tied to the collaborative problem solving (CPS) instruments revealed that it would be essential to gain more information about the structure of CPS; furthermore, the validation of the CPS assessment tools should also be crucial. However, there is a lack of instruments which can fulfil these aims. The goal of our study is to create an effective tool for assessing collaborative skills which can serve as a basis of validity studies connected to CPS instruments and it is appropriate for deepen our knowledge about the structure of CPS competence. We created a questionnaire based on the theoretical model of Hesse et al. (2015). It contained three subscales connected to nine subskills which were assessed with four, overall 36 items. The online questionnaire was administered to 2128 Grade 8 students ($M_{age}=14.7$ years; $SD=.47$). Based on the results of the confirmatory factor analysis we have excluded 18 items. The remaining 18 items show an acceptable fit regarding to the one- ($\chi^2=1875.91$ df=135; $p<0.01$; CFI=0.942; TLI=0.934; RMSEA=0.078) and the three-dimensional models ($\chi^2=1802.83$; df=132; $p<0.01$; CFI=0.944; TLI=0.935; RMSEA=0.077). The reliability indexes of the 18-item scale and the subscales are sufficient (Cronbach- $\alpha=0.70\text{--}0.90$). All the nine subskills are represented in the shortened scale with at least one item. Our study resulted in a 18-item long questionnaire which is suitable for measuring collaborative skills and for validating the social component of CPS instruments. Our results seem to confirm the theoretical model of Hesse et al. regarding the collaborative skillset.

Peer review in online HE: does the group size influence students' participation and performance?

Keywords: Assessment Methods and Tools, Cooperative/Collaborative Learning, Higher Education, Peer Interaction

Presenting Author:Anna Serbati, University of Padova, Italy; **Co-Author:**Valentina Grion, University of Padova, Italy; **Co-Author:**Lan Li, Bowling Green State University, United States

The educational literature has demonstrated the importance of students playing an active role in assessment processes (Sambell, McDowell, & Montgomery, 2013). More specifically, according to a sustainable assessment perspective (Boud, 2000; Boud & Soler, 2016), assessment tasks need to be related to the development of lifelong learning skills and are called to foster evaluative judgement capabilities that are required in real professional and life contexts. The present study examined how group size may impact students' participation, perceptions, and work quality in an online peer review activity. One hundred sixty-three college freshmen were randomly assigned into three conditions that consisted of either 3-student groups, 6-student groups, or 9-student groups. Students reviewed each other's projects within their groups. Upon receiving peer feedback, students improved their own work. The data analysis suggested that students in smaller groups participated in peer review discussion more actively than students in bigger groups. For students' perceptions, students' responses to SCS (Sense of Community Scale) and IMI (Intrinsic Motivation Inventory) questionnaires did not show considerable differences between the three groups. For work quality, data analyst indicated that students in bigger groups outperformed students in smaller groups.

Exploring group-based learning assessment's construct and consequential validity in higher education

Keywords: Assessment Methods and Tools, Case Studies, Cooperative/Collaborative Learning, Higher Education

Presenting Author:Hajo Meijer, University of Groningen, Netherlands; **Co-Author:**Jasperina Brouwer, University of Groningen, Netherlands; **Co-Author:**Rink Hoekstra, University of Groningen, Netherlands; **Co-Author:**Jan-Willem Strijbos, University of Groningen, Netherlands

Group-based learning assessment seems to increasingly impact students' assessments and subsequently students' individual transcripts of records in higher education. Nevertheless, construct and consequential validity of group-based learning assessment methods might be debatable, since curricula in higher education typically focus on the assessment of students' individual domain-specific abilities (e.g., knowledge and/or skills). Therefore, we explored the construct and consequential validity of (a) individual, (b) group, and (c) group combined with individual assessment of group-based learning in an undergraduate university course. Students ($N = 29$) took an individual essay examination and worked in eleven small groups (2-3 students) on an assessed assignment consisting of a near identical group and individual part. This allowed us to compare grades based on the group part of the assignment, the individual part of the assignment, and the combination of the group and individual parts of the assignment with each other, as well as with students' grades on the individual essay examination. Pearson correlation coefficients revealed low to high correlations ($r = .30$ to $.91$) between individual, group, and combined grades within the assignment. In addition, given the current focus in higher education on measuring students' individual domain-specific abilities, the grades obtained from the group part of the assignment are the least construct valid measures in this study when using the individual assignment part and individual essay examination grade as criterion. Combining the group and individual parts of the assignment increases the construct validity and thereby reduces the bias for more and less able students in groups.

Session W 9

27 August 2021 09:00 - 10:00

Session Room 16

Single Paper

Higher Education, Learning and Instructional Technology

Educational and Learning Technologies

Keywords: Argumentation, Educational Technology, Higher Education, Learning Technologies, Meta-analysis, Writing/Literacy

Interest group: SIG 04 - Higher Education, SIG 12 - Writing

Chairperson: Irina Engeness, Norway

Effects of digital media on learning in higher education: A systematic review of meta-analyses

Keywords: Educational Technology, Higher Education, Learning Technologies, Meta-analysis

Presenting Author: Sonja Berger, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:** Karsten Stegmann, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:** Tamara Kastorff, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:** Michael Sailer, LMU Munich, Germany; **Co-Author:** Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

This systematic review of meta-analyses addresses the extent to which learning outcomes can be promoted by digital media in higher education. Meta-analyses on the impact of digital media on learning in higher education typically focus on moderator analyses with respect to specific technological features or features of specific instructional approaches (e.g. "realism of graphics" in game-based learning). Unlike these previous meta-analyses of learning with digital media, this systematic review aggregates the effects of digital media by the level of learning activity they induce to gain more general and transferable insights into the effects of digital media on learning. To this end, the control and experimental conditions of 462 effect sizes from 79 meta-analyses were coded using the ICAP framework. The ICAP framework distinguishes four levels of cognitive activation inferred by observable behavior: (1) passive, (2) active, (3) constructive, and (4) interactive. The positive effects of digital media within ICAP levels on learning outcomes in higher education (RQ1) support the hypothesis that digital media are effective in increasing the likelihood of certain learning activities. The positive effects of digital media across ICAP levels on learning outcomes (RQ2) indicated that digital media can be used effectively to increase activity levels. It should be noted, however, that due to the confounding of activity level and digital media use, caution is advised when interpreting this as a causal effect of digital media. In sum, these results support the ICAP framework and assumptions about the relationship between varying levels of activity and learning outcomes.

Speech-to-Text and the Struggling Writer: Effects on Learning a New Writing Strategy

Keywords: Argumentation, Educational Technology, Learning Technologies, Writing/Literacy

Presenting Author: Katrina Haug, Western University, Canada; **Co-Author:** Perry Klein, The University of Western Ontario, Canada

Speech-to-text (STT) is a readily used accommodation for children and adults who struggle with written composition. While there is evidence to support the use of speech-to-text, few studies have considered the impact of STT on learning a new writing strategy. The purpose of the current study was to evaluate STT and its impact on learning a new writing strategy (e.g., persuasive writing) particularly for students considered struggling writers. Participants included 79 students in grades 4 – 6 who received persuasive writing instruction and STT training. All students were randomly assigned to either the handwritten or STT treatment condition. A pretest-post-test design was used to capture student learning and writing improvement related to persuasive writing. A repeated measures analysis of variance (ANOVA) was used to examine the relationship between struggling and not struggling writers and their achievement from pretest to post-test in both the handwritten and STT conditions. First analysis results indicate that for weaker writers, speech-to-text was more effective than handwriting in learning a new writing strategy, while for average or above average writers, handwriting was most effective. Overall, the current study provides evidence to support the use of speech-to-text technology to aid struggling writers and filled a gap in the literature between speech-to-text as beneficial on a single text to improve spelling and speech-to-text as support to learn a new genre for struggling and non-struggling writers.

Session W 10

27 August 2021 09:00 - 10:00

Session Room 18

Single Paper

Teaching and Teacher Education

Educational Psychology and Motivation

Keywords: Educational Psychology, Motivation, Secondary Education, Self-efficacy, Teaching/Instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Scarlett Madeline Kobs, Humboldt Universität zu Berlin, Germany

Teachers' communicative style: The role of autonomy, competence and relatedness

Keywords: Educational Psychology, Motivation, Secondary Education, Teaching/Instruction

Presenting Author: Samuel Falcon, University of Las Palmas de Gran Canaria, Spain; **Co-Author:** Elisa Santana Monagas, University of Las Palmas de Gran Canaria, Spain; **Co-Author:** Juan L. Núñez, University of Las Palmas de Gran Canaria - Faculty of Educational Sciences, Spain; **Co-Author:** Juan Francisco Loro, University of Las Palmas de Gran Canaria, Spain; **Co-Author:** Jaime Leon, University of Las Palmas de Gran Canaria, Spain

Teachers' communicative style has been recently addressed by researchers, yet the reason why teachers use a certain style remains unexplored. This study aimed to identify profiles of teachers' communicative style and how these relate to teachers' needs (autonomy, relatedness and competence) and students' performance. The sample comprised a total of 48 teachers and 1150 students. At the student-level, latent profile analysis showed three profiles: gain-framed messages (GFM), no-messages (NM), and all-messages (AM). At the teacher-level, multilevel profile analysis showed an active and a passive profile. Results indicated that both, the thwarting and the fulfillment, of teachers' basic needs was related to the communicative style they adopted. Likewise, the communicative style adopted by teachers was related to student's performance. Thus, present findings help to better understand why teachers adopt certain behaviours and how these relate to student outcomes.

Do motivational messages predict motivation to learn and performance?

Keywords: Educational Psychology, Motivation, Secondary Education, Teaching/Instruction

Presenting Author: Elisa Santana Monagas, University of Las Palmas de Gran Canaria, Spain; **Co-Author:** Dave Putwain, Liverpool John Moores University, United Kingdom; **Co-Author:** Juan L. Núñez, University of Las Palmas de Gran Canaria - Faculty of Educational Sciences, Spain; **Co-Author:** Juan Francisco Loro Ferrer, University of Las Palmas de Gran Canaria, Spain; **Co-Author:** Jaime Leon, University of Las Palmas de Gran Canaria, Spain

Teachers can use motivational messages during classes to engage their students in school-tasks. These messages are characterized by both the frame (gain-framed vs loss-framed) and by the motivational appeals within them (external, introjected, identified, and intrinsic). For example, teachers can rely on gain-framed intrinsic messages such as "*If you work hard, you will learn interesting facts*" or they can rely on loss-framed extrinsic messages such as "*Unless you work hard, you will get into trouble*". The present study examines how teachers' motivational messages relate with student's motivation to learn and performance. A total of 1209 students between grades 8 and 12 participated in the study. Participants completed self-report measures of teachers' motivational messages and motivation to learn. Performance was measured using students' grades obtained from school records. We performed a multilevel structural equation model (ML-SEM) to test the hypothesised relations among variables. ML-SEM showed that teacher motivational messages indirectly predicted student's performance via motivation to learn. The present findings highlight a resource teacher can rely on to motivate students and improve their academic outcomes. These results set the basis for future educational interventions targeting teaching practices.

Teacher Classroom Management Self-Efficacy: Relations to Perceived Teaching Behaviors and Enjoyment

Keywords: Educational Psychology, Motivation, Self-efficacy, Teaching/Instruction

Presenting Author:Katharina Hettinger, University of Potsdam, Germany; **Co-Author:**Rebecca Lazarides, University of Potsdam, Germany; **Co-Author:**Charlott Rubach, University of California, Irvine, United States; **Co-Author:**Ulrich Schiefele, University of Potsdam, Germany

Abstract This study examined the relations between teacher-reported self-efficacy in classroom management, student-reported characteristics of teaching quality and students' enjoyment in mathematics. Longitudinal questionnaire data were collected from German ninth and tenth-grade students ($N = 779$) and their teachers ($N = 40$) at the beginning and at the middle of the school year. Results from multilevel modelling showed that teachers' self-efficacy in classroom management at time 1 significantly and positively related to student-perceived class-level monitoring and to social relatedness at time 2. Class-level social relatedness at time 2 was significantly and positively associated with students' enjoyment in mathematics at time 2.

Session W 11

27 August 2021 09:00 - 10:00

Session Room 15

Single Paper

Higher Education, Instructional Design

Teacher Professional Development and Teaching Approaches

Keywords: Higher Education, In-service Teacher Education, Inquiry Learning, Primary Education, Reasoning, Science Education, Survey Research, Teacher Professional Development, Teaching Approaches

Interest group: SIG 04 - Higher Education, SIG 20 - Inquiry Learning

Chairperson: Mandy Hommel, Germany

A follow-up study on university teachers' visual and verbal processing of classroom situations

Keywords: Higher Education, In-service Teacher Education, Teacher Professional Development, Teaching Approaches

Presenting Author:Henna Vilppu, University of Turku, Finland; **Co-Author:**Erkki Anto, University of Turku, Finland; **Co-Author:**Mari Murtonen, University of Turku, Finland

Professional vision, i.e. the ability to notice and interpret significant interactions in the classroom, is an important part of teachers' pedagogical expertise. Pedagogical training has been documented to influence university teachers' in becoming more learning-focused in their thinking. In this study, we aim to explore how university teachers visually and verbally process information of teaching-learning situations, and whether prior pedagogical training has an influence on this. Further, we aim to study whether participating short online pedagogical courses can have an effect on this processing. In the pretest, a total of 49 participants watched short video clips of teaching-learning situations twice. During the second watch, they were prompted to think aloud. In the posttest, twenty of the participants, who had taken part in short online university pedagogy trainings (1-3 ECTS in total) as an intervention, watched the same video clips again. The videos were divided into areas of interest (AOIs), which were the students, the teacher and the slides. The think-aloud protocols were analyzed qualitatively. The results show that in the pretest, participants with previous pedagogical training looked more the AOI of students and less the teacher than those who did not have any pedagogical training. From pretest to posttest, those with no previous pedagogical training shifted their attention more on the students. Further, from pretest to posttest, all the participants changed their interpretations towards reflecting a more learning facilitation view of teaching. Thus, it seems that the effects of pedagogical training can be seen both on visual and verbal processing.

Teachers' regulation, learning patterns and teaching approaches: Does pedagogical training matter?

Keywords: Higher Education, Survey Research, Teacher Professional Development, Teaching Approaches

Presenting Author:Tahani Aldahdouh, Tampere University, Finland; **Co-Author:**Mari Murtonen, University of Turku, Finland; **Co-Author:**Trang Nguyen, University of Turku / Faculty of Education, Finland; **Co-Author:**Jere Riekkinen, Tampereen yliopisto, Finland; **Co-Author:**Henna Vilppu, University of Turku, Finland; **Co-Author:**Jan Vermunt, Eindhoven University of Technology, Netherlands

This study set out to investigate the relationships among university teachers' regulation of learning, their learning patterns and teaching approaches. A total of 378 teachers working at Tampere universities filled in a self-reported questionnaire. Data were analyzed by means of Structural Equation Modelling (SEM). The results revealed that the more teachers show willingness to regulate their learning, the more they embrace meaning-oriented learning pattern, and the more their teaching practices focuses on the student. On the contrary, the findings also suggested that the less teachers show willingness to regulate their learning, the more they embrace problematic-oriented learning pattern, and the less their teaching practices focuses on the student. Further, the findings provided evidence on the positive effect of the pedagogical training on fostering teachers' regulation. Unlike novice teachers, experienced teachers seemed to show less willingness to regulate their learning. Plausible explanations for these results and implications for future research are discussed.

Effects of micro- and macro-adaptive instruction on children's learning of scientific reasoning

Keywords: Inquiry Learning, Primary Education, Reasoning, Science Education

Presenting Author:Erika Schlatter, Radboud University, Netherlands; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Ard Lazonder, Radboud University, Netherlands

Scientific reasoning is an important skill that helps children understand the world around them. Teaching scientific reasoning starts in primary school and can be challenging: not all component scientific reasoning skills develop at the same age and not all children learn these skills at the same pace. A differentiated teaching approach thus seems called for, but few guidelines for adaptive science instruction exist. The current study sought to aid the development of such guidelines by comparing two types of adaptive instruction to a non-adaptive control condition. Over the course of four lessons, children in the control condition ($n=49$) practiced scientific reasoning skills with the help of worksheets with light support. Children in the two adaptive instruction conditions received worksheets with more specific support that was either based on their standardized test scores of reading comprehension and mathematical skillfulness (macro-adaptive condition; $n=58$) or their performance in the previous lesson (micro-adaptive condition; $n=46$). Thus, the two adaptive conditions differed regarding the information used to assign children to a level of instruction, as well as the frequency with which this information was updated. Analysis of children's pre- and posttest scores showed improved scientific reasoning ability in all three conditions, but no effect of condition was found. Further analysis of children's worksheets is ongoing and will reveal whether the adaptive instructions had a differential effect on children's scientific reasoning during the lessons.

Session W 12

27 August 2021 09:00 - 10:00

Session Room 2

Single Paper

Higher Education, Learning and Instructional Technology, Motivational, Social and Affective Processes

Metacognition and Self-regulation

Keywords: Cognitive Skills, Collaborative Learning, Educational Psychology, Engineering, Higher Education, Metacognition, Self-regulation

Interest group: SIG 16 - Metacognition

Chairperson: Frank Hellmich, Paderborn University, Germany

How individual learner characteristics are (not) related to students' adoption of shared regulation

Keywords: Collaborative Learning, Higher Education, Metacognition, Self-regulation

Presenting Author:Liesje De Backer, Ghent University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium; **Co-Author:**Martin Valcke, Ghent University, Belgium

The present study investigates whether individual learner characteristics can explain differences in university students' engagement in socially shared metacognitive regulation (SSMR) during face-to-face collaborative learning. Students' motivation for learning, self-efficacy for learning and regulation, feeling of relatedness to the group, and individual repertoire of metacognitive regulation skills are taken into consideration. SSMR was analysed through systematic observation of video recorded sessions (22.5 hours of recording) of 15 collaborative learning groups, comprised of five students each, working on assignments aimed at deepening domain-specific knowledge. The study more particularly involved 73 students in the Educational Sciences programme, who further completed questionnaires and a think-aloud task. Multilevel models were run to investigate the relation between individual learner characteristics and students' involvement in SSMR. The results revealed that only students' adoption of metacognitive regulation during individual learning and their self-efficacy for regulation are significant for predicting their engagement in SSMR when collaborating with peers. The effect size of both is moreover rather small. Nevertheless, the results are innovative since they extend the emerging theory on shared metacognitive regulation.

Individual Performance Feedback: Does It Increase the Use of Retrieval Practice?

Keywords:Cognitive Skills, Educational Psychology, Metacognition, Self-regulation

Presenting Author:Luotong Hui, Maastricht University, Netherlands; **Co-Author:**Anique de Bruin, Maastricht University, Netherlands; **Co-Author:**Jeroen Donkers, Maastricht University, Netherlands; **Co-Author:**Jeroen Van Merriënboer, Maastricht University, Netherlands

Self-testing leads to more accurate judgements of learning (JOLs) and more long-term knowledge retention than restudying. It is a well-known effective learning strategy to optimize learning. However, self-testing is hardly appreciated and underutilized by students. It is probably because learners cannot perceive the benefits during using self-testing, due to the memorial advantage of self-testing shows up with a delay. If the benefits (i.e., the testing effect) are directly experienced by students, for example, by seeing that their actual learning performance after self-testing is superior to that after restudying, students might start using this strategy to a greater extent. The reported study aims to examine: (1) whether self-testing impacts the accuracy of JOLs and (2) whether experiencing the benefits from self-testing promotes the frequency of choosing self-testing. In our study with 68 university students, we first asked participants to study with both self-testing and restudying and do JOLs, and then to choose one of the strategies during learning new materials, either by self-testing or by restudying. After a 7-day interval, a delayed test was administered and their test performance was shown to them. Afterwards, students again chose a strategy during learning new materials. We found that self-testing led to more accurate JOLs and that the performance feedback strongly enhanced the choice of self-testing, but only when self-testing in fact was superior to restudying.

Metacognitive illusion or self-regulated learning? Learning strategies in engineering education

Keywords:Engineering, Higher Education, Metacognition, Self-regulation

Presenting Author:Maria Cervin-Ellqvist, Chalmers University of Technology, Sweden; **Co-Author:**Daniel Larsson, Chalmers University of Technology, Sweden; **Co-Author:**Tom Adawi, Chalmers University of Technology, Sweden; **Co-Author:**Christian Stöhr, Chalmers University of Technology, Sweden; **Co-Author:**Raffaella Negretti, Chalmers University of Technology, Sweden

Knowing how students approach learning in higher education contexts is key to promote learning strategies that are effective in the long run, in university and in their future work-life. Previous research has concluded that students often use ineffective learning strategies but believe them to be effective—a phenomenon known as metacognitive illusion. In a bid to broaden the perspective on students' use of learning strategies, this study draws on the notion of self-regulated learning as a theoretical lens. A questionnaire, comprising both open-ended and closed-ended questions, was developed to gather data from 416 engineering students. The questionnaire was geared towards (1) mapping what learning strategies students use in a real-world setting, in real courses; (2) probing their metacognitive awareness of the effectiveness of various learning strategies; and (3) investigating why students choose certain learning strategies. We also compared which learning strategies the engineering students chose across programs and types of courses. The findings reveal a complex picture of why students sometimes use seemingly ineffective learning strategies, and we conclude that this is not always due to metacognitive illusion. It is instead often linked to attempts to regulate behaviour, motivation and/or learning context, sometimes in response to the context. This study adds to the current HE research investigating students' abilities to reflect on, assess and take control of their learning in an effective way, confirming that students need explicit guidance.

Session W 13

27 August 2021 09:00 - 10:00

Session Room 3

Single Paper

Developmental Aspects of Instruction, Higher Education, Lifelong Learning

Interdisciplinary, Mixed-Method Research

Keywords:Developmental Processes, Higher Education, Interdisciplinary, Mixed-method Research, Phenomenography, Qualitative Methods, Technology, Vocational Education

Interest group:SIG 04 - Higher Education, SIG 09 - Phenomenography and Variation Theory, SIG 14 - Learning and Professional Development

Chairperson:Clara Schumacher, Humboldt Universität zu Berlin, Germany

Extending phenomenographic analysis by using Q methodological approach – a theoretical contribution

Keywords:Interdisciplinary, Mixed-method Research, Phenomenography, Qualitative Methods

Presenting Author:Mona Holmqvist, Malmö University, Sweden; **Presenting Author:**Adrian Lundberg, Malmö University, Sweden

This theoretical contribution aims to investigate, illustrate and critically discuss in what way a research process combining Q methodology and phenomenography could achieve a highly systematic and solid analysis of respondents' expressed experiences.

Since the start of the development of the research approach, phenomenography has focused on respondents' conceptions or experiences, and qualitative differences between differently expressed phenomena captured through a qualitative analysis. Critic has been raised against the de-contextualization during the analysis, and by that, the disregard of differences of experiences in relation to contextual aspects. Lately, it has been claimed that the development of phenomenography as a methodological approach has been sparse. Instead, there has been a focus on variation theory to enhance the theoretical stance based on the approach. Q methodology, which is equally interested in the investigation of individual and shared viewpoints, as well as lived experiences has recently gained in popularity. Built-in features of this approach present a systematic means to access participants' subjectivity. This paper therefore suggests an extension of phenomenographic analysis by using Q methodology. Simultaneously, phenomenographic research consists of potentially valuable aspects for Q methodology. In this paper, aspects of strengths of both approaches, phenomenography and Q methodology are outlined, and complementary contributions to their development are grounded in previous empirical research. As a result, the proposed methodological tool is expected to contribute to educational research aiming at better understanding how concepts and phenomena are perceived differently. This will significantly impact educational policy formation and implementation.

When to co-create education with students? Comparing different momentums of co-creation

Keywords:Developmental Processes, Higher Education, Interdisciplinary, Mixed-method Research

Presenting Author:Tanguy Dewaele, Maastricht University, Netherlands; **Co-Author:**Stephanie Meeuwissen, Maastricht University, Netherlands; **Co-Author:**Jeroen Van Merriënboer, Maastricht University, Netherlands; **Co-Author:**Marjan Vermeulen, Heerlen Open Universiteit, Netherlands; **Co-Author:**Karen Könings, Maastricht University, Netherlands

The recent emerging interest into co-creation of education has led to a significant rise in knowledge on this topic, identifying many benefits, like increased motivation, sense of belongingness and improved student-teacher relationship. However, little evidence is available as to *when* co-creation should be implemented to maximize its beneficial effects, i.e., before or after a course takes place. To understand the effect of the momentum of co-creation, this study aims to 1) unravel differences and similarities between co-creation discussions prior or after a course and 2) investigate whether this momentum influences participants' satisfaction with the course. Therefore 57 medical residents, participating in a patient safety course, were divided over seven groups. Four groups co-created the course prior to receiving it, three groups co-created afterwards. Transcripts of these co-creation discussions were analyzed using template analysis, in which deductive, a-priori coding with characteristics of the 4C/ID (four-component instructional design) model was performed, as well as inductive, open coding. Finally, a satisfactory evaluation questionnaire was carried out. Participating residents in the beforehand condition showed more creativity during the co-creation sessions, leading to the exploring of more possibilities in course design, while the afterwards condition mainly reflected on the course content. Student satisfaction at the end of the course was higher for those who co-created beforehand than for those who co-created afterwards. This study proves that the chosen momentum at which co-creation takes place, impacts the content of the co-creation discussions and student satisfaction with clear added value for co-creation prior to a course.

The Impact of Technology on Work Characteristics and Professional Development

Keywords: Interdisciplinary, Mixed-method Research, Technology, Vocational Education

Presenting Author:Patrick Beer, University of Regensburg, Germany; **Co-Author:**Regina Mulder, University of Regensburg, Germany

Due to technological developments, organisations such as hospitals or banks need employees capable of managing change and continuously developing themselves. Empirical evidence on how technology is affecting work characteristics is scarce. This also goes for the skills needed and the impact on learning and development. To close this gap, this study seeks to answer these research questions: What are the effects of technological developments on work characteristics, and what are the effects of the changes at work caused by these developments on learning activities of employees?

Professional development contains three components, namely elaboration, expansion and externalisation, that can be fostered by new technologies conceptualized as tools and systems that affect the accomplishment of work tasks. Technologies as well as their consequences for work, such as increasing autonomy or complexity, can be used as triggers for learning.

The first part of this study is a systematic literature review. Empirical evidence was identified by searching databases from different disciplines. The analyses of twenty-one studies revealed complex relations between different technologies and work characteristics. For instance, complexity increased when working with automated systems and robots, while workload and autonomy increased with information and communication technologies.

The second part is a currently running exploratory study with semi-structured interviews that builds on the previous findings. So far, eight finance employees have been interviewed and the interview data is analysed at the time of drafting this proposal. The outcomes will give insight into for instance how automation affects individual time management, creating opportunities for professional development.

Session W 14

27 August 2021 09:00 - 10:00

Session Room 4

Single Paper

Learning and Instructional Technology, Learning and Social Interaction, Teaching and Teacher Education

Teacher Professional Development and Instruction

Keywords: Conversation/Discourse Analysis, E-Learning/Online Learning, Language (Foreign and Second), Mathematics, Primary Education, Teacher Professional Development, Teaching/Instruction, Vocational Education

Interest group: SIG 14 - Learning and Professional Development, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Leila Ferguson, Kristiania University College, Norway

Towards a future vocational profession: Longitudinal orientations in vocational teaching practices

Keywords: Conversation/Discourse Analysis, Teacher Professional Development, Teaching/Instruction, Vocational Education

Presenting Author:Stig-Börje Asplund, Karlstad University, Sweden; **Presenting Author:**Nina Kilbrink, Karlstad University, Sweden; **Co-Author:**Hamid Asghari, Karlstad University, Sweden; **Co-Author:**Minna Viljamaa, Karlstad University, Sweden

This presentation focuses on the future-oriented movements that take shape when vocational teachers and vocational students negotiate how a practical task could, and should, be handled and solved in vocational teaching situations in vocational workshop settings. The data consists of video recorded lessons from four vocational programmes in Swedish upper secondary school, and the analysis is based on the theoretical and methodological framework of CAVTA (Conversation Analysis and Variation Theory Approach). By focusing on the longitudinal orientations towards a future doing that are set into play in the teaching situations, we will show how aspects concerning a specific vocational learning content that revolves around a vocational practical doing compete for the space by a vocational learning content of a more general nature. We argue that the specific and the general vocational learning content does not necessarily have to be in conflict with each other in the teaching situation. Rather, they can complement each other and open up for more in-depth vocational learning. As such, our study emphasises the importance for vocational teachers to develop teaching strategies to navigate between helping the students in their problem solving here and now, and contextualising the specific vocational learning content and making vocational learning relevant for future vocational occupation and working life.

Supporting Teachers to Promote Cognitive Activation and Differentiation: Product or Process?

Keywords: Mathematics, Primary Education, Teacher Professional Development, Teaching/Instruction

Presenting Author:Charalambos Charalambous, University of Cyprus, Cyprus; **Presenting Author:**Evdikidi Kasapi, University of Cyprus, Cyprus; **Co-Author:**Kassandra Georgiou Foivou, University of Cyprus, Cyprus

Recently, a lot of emphasis has been placed on understanding how schools can concurrently pursue quality and equity. Missing from this body of work seem to be studies that zoom in on the level of teachers and try to understand how teachers work toward concurrently addressing this dual goal. Focusing on an intervention aiming to support 27 elementary schoolteachers (prospective and practicing) to address cognitive activation (quality) and differentiation (equity) in mathematics, while experimenting with different tools in their teaching (e.g., enablers and extenders), the present study provides both a process and product delineation of the implementation of this intervention. In particular, using a mixed-methods triangulation design and analyzing a rich data corpus including coded videotaped lessons, lesson plans, teacher interviews, and teacher reflection cards, we provide different pictures of the implementation of the intervention sketched through either of the two lenses (process vs. product), suggesting how the two lenses can function complementarily in informing our understanding of the phenomenon at hand. As such, this study makes a case that in educational effectiveness and improvement research it is important to study and understand both the changes in teachers' practice as well as the underlying processes that lead to such changes.

Digital as the new "normal" during COVID19: Implications for teachers of Swedish for immigrants

Keywords: E-Learning/Online Learning, Language (Foreign and Second), Teacher Professional Development, Teaching/Instruction

Presenting Author:Sylvana Sofkova Hashemi, University of Gothenburg; Halmstad University, Sweden; **Co-Author:**Nataliya Berbyuk Lindström, University of Gothenburg, Sweden

This study explores the perceptions of the teachers working with language courses for immigrants (Swedish For Immigrants; SFI) on switching to online teaching during COVID19 pandemic. Changes in the learning environment challenge teachers in need of new skills, concepts and languages, as well as didactic tools. Based on questionnaire and interviews of 60 SFI-teachers enrolled in a municipal adult education, the online teaching was perceived as effective and enhancing digital skills, requiring new pedagogy and infrastructure, and experiences of lack of social interaction by teachers and students. The case study demonstrates the challenge of organizing online teaching in general that requires time and testing of technology onsite, development in infrastructure and

professional space for competence development. Particularly the missing social interaction proves online education in SFI-course not that optimal as for many immigrants it is a crucial step in the integration process.

Session W 15

27 August 2021 09:00 - 10:00

Session Room 9

Single Paper

Culture, Morality, Religion and Education

Environmental Education

Keywords: Citizenship Education, Communities of Practice, Environmental Education, Ethnography, Philosophy, Qualitative Methods

Interest group: SIG 25 - Educational Theory

Chairperson: Alessio Surian, Università degli Studi di Padova, Italy

Enchantment and student activism: Designing pedagogies to address current climate-related crises

Keywords: Communities of Practice, Environmental Education, Ethnography, Qualitative Methods

Presenting Author: Peter David Renshaw, The University of Queensland, Australia; **Co-Author:** Ron Tooth, Pullenvale Environmental Education Centre, Australia; **Co-Author:** Harriet Mortlock, Pullenvale Environmental Education Centre, Australia; **Co-Author:** Kirsty Jackson, The University of Queensland, Australia

The school strikes of 2019 witnessed student activism on a global scale and challenged educators to consider more activist-oriented pedagogies that support students to be agents of change in their societies. In this paper we suggest that student activism can arise from pedagogies of enchantment, that is, pedagogies that engage students emotionally and aesthetically with the more-than-human world. We deploy Vygotsky's notion of *perezhivanie* to theorise experiences of enchantment, and provide a detailed case-study of how enchantment led two Year 4 students, Reshma and Lucie, to become environmental activists within their school. Their learning as activists at school provides an authentic apprenticeship for the civic activism and engagement required to address current climate-related crises.

Agency formation of youth climate activists: A learning ecology perspective

Keywords: Citizenship Education, Communities of Practice, Environmental Education, Qualitative Methods

Presenting Author: Paula Ahola, University of Eastern Finland, Finland; **Presenting Author:** Antti Rajala, University of Oulu, Finland; **Co-Author:** Sanna Ryyränen, University of Eastern Finland, Finland; **Co-Author:** Anna Stetsenko, CUNY Graduate Center, United States

Agency gains in importance in research on learning, foregrounded centrally within a transformative view of learning. Research on students' transformative actions and agency so far has mostly been confined to a limited range of local issues and communities. More rarely have empirical studies of learning, focused on youth as historical actors capable of influencing social practices in society, especially in the context of a challenge as daunting as the environmental catastrophe. This study focuses on youth agency formation in relation to the environmental crisis. We draw from a learning ecology perspective to foreground youth agency formation across a range of meaningful contexts of their lives, including, for example, school, family activity, and civic actions. Our argument is grounded in a transformative activist stance, which views human development as coconstructed by people understood to be agentive actors of social practices, their own lives, identities, and common history. Our empirical inquiry focuses on experiences of Finnish youth climate activists, reported to us in focus group interviews. We pose the following research questions to guide our inquiry: What processes of agency formation can be identified in the youth climate activists' accounts of their experiences? What structures and resources enable and create obstacles for agency formation of youth climate activists? The findings of the study contribute to a nuanced understanding of underresearched transformative forms of agency and how it is shaped in and by different spheres of youth's learning ecologies, including school. Our study has important pedagogical implications for addressing climate change and youth agency in education.

Self-education for our times

Keywords: Citizenship Education, Environmental Education, Philosophy, Qualitative Methods

Presenting Author: Jan Varpanen, University of Tampere, Finland, Finland; **Co-Author:** Antti Saari, University of Tampere, Finland

Education should not only be concerned with what happens in schools or other educational institutions but should also take an interest in what happens when the young people leave those institutions behind and start to lead independent lives. In this theoretical paper, we start from the challenges that the global ecological crises place on self-education in the lives of (young) adults. We suggest that facing the challenges posed by the ecological crises constitutes a unique context that potentially problematizes some of the existing conceptualizations of self-education. We review some of the most prominent theoretical resources that have in the past been used to conceptualize the phenomenon of self-education. Our analysis of the concepts of transformative learning, *Bildung* and technologies of the self shows that each of these traditions has important contributions to make. However, we also show that these traditional concepts come up short in some respects and that further theoretical work is needed in conceptualizing self-education in the anthropocene.

Keynotes IV 1

27 August 2021 10:45 - 11:45

Auditorium B

EARLI Keynote Session

Thinking Beyond the Crises: what is a university education for?

Keywords: Economics of Education, Educational Policy, Higher Education, Synergies between Learning; Teaching and Research

Interest group:

Chairperson: Ake Ingberman, University of Gothenburg, Sweden

The global pandemic had led to changes to university teaching and learning practices and significant financial pressures on the global higher education sector. This has given increased urgency to questions about the purposes of a university education. With societies across the world facing unexpected social and economic challenges in the wake of Covid-19, there is a danger that economic arguments will further increase their domination of thinking about the fundamental nature of university education. A danger because we run the risk of losing a sense of the educational nature of university education and the many ways in which going to university can transform students' lives and contribute to the well-being of societies. Against this backdrop, I will examine a series of myths related to the purposes of a university education and show how these myths combine insidiously to support a view that the purpose of higher education is to 'signal' that graduates are worth employing. I will argue that this undermines higher education as an educational endeavour because it implies there is nothing special about the knowledge, educational processes, or institutional settings offered by universities. In response, I will explore what is needed to reinvigorate our understanding of university education. My argument for a university education puts at its heart how students develop transformational relationships towards disciplinary and professional knowledge and I will explain what these relationships look like in a range of subject areas. I will conclude by exploring the implications of this way of thinking for how we can frame an educational justification for university education that takes our thinking far beyond the immediate crises caused by the global pandemic.

Thinking Beyond the Crises: what is a university education for?

Presenting Author: Paul Ashwin, Lancaster University, United Kingdom

The global pandemic had led to changes to university teaching and learning practices and significant financial pressures on the global higher education sector. This has given increased urgency to questions about the purposes of a university education. With societies across the world facing unexpected social and

economic challenges in the wake of Covid-19, there is a danger that economic arguments will further increase their domination of thinking about the fundamental nature of university education. A danger because we run the risk of losing a sense of the educational nature of university education and the many ways in which going to university can transform students' lives and contribute to the well-being of societies. Against this backdrop, I will examine a series of myths related to the purposes of a university education and show how these myths combine insidiously to support a view that the purpose of higher education is to 'signal' that graduates are worth employing. I will argue that this undermines higher education as an educational endeavour because it implies there is nothing special about the knowledge, educational processes, or institutional settings offered by universities. In response, I will explore what is needed to reinvigorate our understanding of university education. My argument for a university education puts at its heart how students develop transformational relationships towards disciplinary and professional knowledge and I will explain what these relationships look like in a range of subject areas. I will conclude by exploring the implications of this way of thinking for how we can frame an educational justification for university education that takes our thinking far beyond the immediate crises caused by the global pandemic.

Keynotes IV 2

27 August 2021 10:45 - 11:45

Auditorium A

EARLI Keynote Session

Vision for Education – How eye-tracking helps to understand and improve learning and instruction

Keywords: Educational Technology, Instructional Design, Learning Analytics, Learning Technologies

Interest group:

Chairperson: Erno Lehtinen, University of Turku, Finland

Nihil in intellectu nisi prius in sensu said saint and philosopher Thomas Aquinas. He argued that everything that is in our mind, we first absorb through our senses. When studying the human mind, how it is constituted, and how it develops through learning, we must thus study how we take in information. As humans we highly rely on our eyes when taking in information. Hence, studying where a person looked at, for how long and in which order can provide us with crucial insight into learning and instruction. The method to measure this visual information intake is eye-tracking. In this keynote I will present where I see *chances* of eye-tracking for theory-building and for educational practice: (i) With eye-tracking we can study the processes underlying learning and expertise development. (ii) Based on such insights, we can improve the instructional design of learning and testing material. (iii) We can also use eye-tracking directly to enhance video tutorials with the visual focus of the teacher (so-called eye-movement modeling examples) or for gaze-based interaction with the instructional material. However, I also want to discuss the *challenges* of eye-tracking. First, I will address methodological limitations: the validity and reliability of eye-tracking and the resulting necessity of methodological triangulation. Second, I will discuss the consequences of the General Data Protection Regulation (GDPR) for the responsible use of eye-tracking in research. As large tech companies, such as Google, Facebook, Microsoft, or Apple, have invested in eye-tracking over the past years, it is likely that eye-trackers will appear in everyday devices and ultimately enter our educational practice. I will thus end with a peak into a possible future where eye-tracking could play a responsible role in education, and what we should refrain from. With this new technology, new chances arise, but also new responsibilities come.

Vision for Education – How eye-tracking helps to understand and improve learning and instruction

Presenting Author: Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands

Nihil in intellectu nisi prius in sensu said saint and philosopher Thomas Aquinas. He argued that everything that is in our mind, we first absorb through our senses. When studying the human mind, how it is constituted, and how it develops through learning, we must thus study how we take in information. As humans we highly rely on our eyes when taking in information. Hence, studying where a person looked at, for how long and in which order can provide us with crucial insight into learning and instruction. The method to measure this visual information intake is eye-tracking. In this keynote I will present where I see *chances* of eye-tracking for theory-building and for educational practice: (i) With eye-tracking we can study the processes underlying learning and expertise development. (ii) Based on such insights, we can improve the instructional design of learning and testing material. (iii) We can also use eye-tracking directly to enhance video tutorials with the visual focus of the teacher (so-called eye-movement modeling examples) or for gaze-based interaction with the instructional material. However, I also want to discuss the *challenges* of eye-tracking. First, I will address methodological limitations: the validity and reliability of eye-tracking and the resulting necessity of methodological triangulation. Second, I will discuss the consequences of the General Data Protection Regulation (GDPR) for the responsible use of eye-tracking in research. As large tech companies, such as Google, Facebook, Microsoft, or Apple, have invested in eye-tracking over the past years, it is likely that eye-trackers will appear in everyday devices and ultimately enter our educational practice. I will thus end with a peak into a possible future where eye-tracking could play a responsible role in education, and what we should refrain from. With this new technology, new chances arise, but also new responsibilities come.

Session X 1

27 August 2021 12:00 - 13:00

Session Room 9

Single Paper

Cognitive Science

Metacognition and Self-Regulation

Keywords: Emotion and Affect, Experimental Studies, Metacognition, Reading Comprehension, Self-regulation, Student Learning, Technology

Interest group: SIG 16 - Metacognition

Chairperson: Rimma Nyman, University of Gothenburg, Sweden

The Role of Achievement Emotions for Metacomprehension Judgments and Accuracy

Keywords: Emotion and Affect, Metacognition, Reading Comprehension, Self-regulation

Presenting Author: Anja Prinz, University of Freiburg, Germany; **Co-Author:** Joerg Wittwer, University of Freiburg, Germany

For effective self-regulated learning from text, it is important that learners accurately monitor and judge their own comprehension, known as metacomprehension accuracy, because this allows them to engage in adaptive control processes. However, learners' metacomprehension is often inaccurate. In two studies, we investigated the role of achievement emotions for metacomprehension judgments and accuracy. The results showed that the learners often used the achievement emotions they experienced during learning (e.g., hope and hopelessness) as judgment cues. In addition, more positive emotions tended to result in greater overconfidence and more negative emotions in greater underconfidence. Therefore, to support learners in self-regulated learning from text, their emotions need to be considered. For example, learners could be informed that their emotions do not necessarily provide valid information concerning their level of comprehension.

Does feedback on students' diagramming affect monitoring accuracy of their text comprehension?

Keywords: Metacognition, Reading Comprehension, Self-regulation, Student Learning

Presenting Author: Sophia Braumann, University Utrecht, Netherlands; **Co-Author:** Janneke van de Pol, Utrecht University, Netherlands; **Co-Author:** Héctor J. Pijieira-Díaz, Maastricht University, Netherlands; **Co-Author:** Ellen Kok, Utrecht University, Netherlands; **Co-Author:** Anique de Bruin, Maastricht University, Netherlands; **Co-Author:** Tamara Van Gog, Utrecht University, Netherlands

Accurate self-monitoring of text comprehension is critical for effective self-regulated learning from texts. Unfortunately, it has been repeatedly shown that students' monitoring of their own text comprehension is often inaccurate which can subsequently lead to inaccurate regulation (i.e., restudy) decisions. Previous

research has also shown that completing causal diagrams at a delay after text reading (*diagramming*) can help to improve students' monitoring of text comprehension. However, even after diagramming, there is still substantial room for improvement. The current study therefore aimed to test whether providing feedback in the form of a performance standard (i.e., a correctly completed diagram) would further increase students' monitoring accuracy. Eighty participants were assigned to four conditions resulting in a 2x2 design with between-subjects factors *diagramming* (yes/no) and receiving a *correct diagram* (yes/no): I. text study only (+ filler-task), II. text study + diagramming, III. text study + diagramming + correct diagram, IV. text study + correct diagram. In each condition, students studied a text, made a judgement of learning before and after the experimental tasks, and completed a comprehension test at the end of each of the (overall six) trials. Results showed that diagramming did not improve monitoring accuracy, while receiving a correctly completed diagram did, independently of whether participants precedingly completed a diagram themselves. Text comprehension was better for those who viewed a correct diagram than for those who did not. Our results underline the significance of providing some sort of feedback (such as completed diagrams) in interventions targeting text comprehension and monitoring accuracy.

Can the Overestimation-with-Internet-Bias be reduced by making task demands explicit?

Keywords: Experimental Studies, Metacognition, Self-regulation, Technology

Presenting Author:Björn Mattes, Technical University of Darmstadt, Germany; **Co-Author:**Stephanie Pieschl, Technical University of Darmstadt, Germany

People generally overestimate their own performance when answering explanatory knowledge questions. This overestimation is further enhanced when people have access to the internet. This Overestimation-with-Internet-Bias could have far-reaching consequences for formal and informal education, where the use of the internet becomes increasingly important. Therefore, we conducted a mixed experiment with 122 participants. Each participant answered four explanatory knowledge questions in a written format and provided predictive and postdictive Metacognitive Confidence Judgements about their performance. We contrasted internet use against non-use (within-subject) and also tried to reduce the Overestimation-with-Internet-Bias by showing or not showing participants a corresponding marking rubric to facilitate task transparency (within-subject and between-subject). The so-called Bias score of the participants was estimated by subtracting their Metacognitive Confidence Judgements from their corresponding Performance regarding each question. While the difference between internet and no-internet conditions was not significant, participants descriptively showed an Overestimation-with-Internet-Bias. Furthermore, overestimation (positive Bias) could be significantly reduced in the rubric compared to the no-rubric conditions. We thus show an easy-to-implement buffer against the Overestimation-with-Internet-Bias which is important for educational settings where cognitive overestimation biases might directly act against successful self-regulated learning.

Session X 2

27 August 2021 12:00 - 13:00

Session Room 16

Single Paper

Learning and Social Interaction, Motivational, Social and Affective Processes, Teaching and Teacher Education

Social Aspects of Learning and Teaching

Keywords: Case Studies, Communities of Learners, Educational Policy, Peer Interaction, Quantitative Methods, Social Aspects of Learning and Teaching, Social Interaction, Survey Research

Interest group: SIG 04 - Higher Education, SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education

Chairperson: Juliene Ferreira, University of Tampere, Finland

Teenagers perception of cyberbullying in rural and urban schools. A case study in Galicia, Spain

Keywords: Case Studies, Communities of Learners, Quantitative Methods, Social Aspects of Learning and Teaching

Presenting Author:Angel Torres-Toukourmidis, Universidad Politecnica Salesiana, Ecuador; **Co-Author:**Claudia Pardo-Ramos, Universidad de Santiago de Compostela, Spain; **Co-Author:**Mari Carmen Caldeiro-Pedreira, Universidad de Santiago de Compostela, Spain

Background. The cases of harassment are more serious from the use of information and communication technologies, especially from the immersion in social networks, presenting the situation of cyberbullying in schools. Objective. Analyzing the relationship between cyber-victims and cyber-bullies with respect to the use of ICTs and identifying the distribution by gender, type of center and academic level of the cases of cyber-bullying. Methodology. A quantitative approach study with a descriptive scope was carried out by applying 238 surveys with 2 dimensions and 21 items to 3rd and 4th grade students of secondary schools in the province of Lugo, Spain belonging to the urban and rural areas. Results. There is a significant relationship between cybervictims and the lack of parental supervision. Likewise, men are frequent aggressors within cyberbullying, while women are equally aggressors in terms of identity theft, ignoring or marginalizing a partner especially in urban centers with no connection to the academic level. Conclusions. Prevention policies must be incorporated in the classroom with the participation of students and teachers to mitigate this type of behavior in educational settings.

Follow the Act or Consider the Consequences? Teachers' Ethics, Self-efficacy and Job Satisfaction

Keywords: Educational Policy, Quantitative Methods, Social Aspects of Learning and Teaching, Survey Research

Presenting Author:Annette-Pascale Denfeld, University of Agder, Norway; **Co-Author:**Esther Canrinus, University of Agder, Norway; **Co-Author:**Inger Marie Dalehete, University of Agder, Norway

In light of a revision of chapter 9A of the Norwegian Education Act, the law obligates teachers to play a more active role in working with students' psychosocial environment. The teacher as agency in the classroom is a decisive factor in fostering positive psychosocial environments. In working with students' psychosocial environment, many situations can cause ethical dilemmas. Thereby, teachers' professional discretion might be dependent on normative ethical drivers in each situation. These drivers can, for example, be characterized as deontological or consequential. The study presented investigates how teachers' approaches to reporting grievances in the psychosocial environment are dependent on their ethical viewpoint, and how the role of self-efficacy and job satisfaction can be assumed to be related to teachers' ethical decisions. This paper presents a small quantitative pilot study analyzing 55 Norwegian teachers' normative ethics approaches in relation to their job satisfaction and self-efficacy with questionnaire data. First findings show that teachers differ in approaching ethical dilemmas and that self-efficacy plays a role in their decisions, while job-satisfaction holds a subordinate position. Thus, the study sheds light on teachers' normative ethics regarding the psychosocial learning environment, also considering individual differences in job satisfaction and self-efficacy. The study provides valuable information for teacher education, teachers' professional development, and policymakers and contributes to a better understanding of aspects fostering or hindering teachers' intervening in the school's psychosocial environment.

How do adolescents' interests develop in relation to the interests of their school network of peers?

Keywords: Peer Interaction, Quantitative Methods, Social Aspects of Learning and Teaching, Social Interaction

Presenting Author:Joris Beek, University Utrecht, Netherlands; **Co-Author:**Larike Bronkhorst, Utrecht University, Netherlands; **Co-Author:**Sanne Akkerman, Utrecht University, Netherlands; **Co-Author:**Tobias Stark, Utrecht University, Netherlands

Studies typically portray studies interest as an intrinsic process of a person (e.g. Hidi & Renninger, 2006), and self-generated (Renninger & Hidi, 2011). Interests are personal, idiosyncratic and define who you are (Hofer, 2010). Inherent to interests are (often extensive) practices linked to interests, who connect you to (likewise interested) others (Akkerman & Bakker, 2019). As such, interests, seemingly contradictory, at the same time they *differentiate you from* as well as *connect you with* others. For adolescents this may be more prominent since they are both discovering themselves and forming important peer relationships. Within school, adolescents display their interests (partly). We aim to study simultaneously change of individuals interests' and social relations over time to examine the interwovenness of interests and the social world. We aim to explore the extent to which peers at school share interests, by questioning: To what extent are adolescents in schools similarly interested and to what extent do adolescents' interests exist or develop within school individually, with close peers or within the school network as a whole? We asked adolescents (n=2333) within one year twice about their interests and with whom they *hang-out* at school (n=9). Adolescents reported 16.314 interest (4.417 unique interests) with frequencies ranging from one (n=569) to 177. Using stochastics actor-based models, we analysed change of interests and social connections. First analyses indicated that after one year adolescents are more inclined to report similar

interests as their peers. This indicates that being (or becoming) interested may not be as individualized as thought.

Session X 3

27 August 2021 12:00 - 13:00

Session Room 7

Single Paper

Motivational, Social and Affective Processes

Attitudes and Beliefs

Keywords: Attitudes and Beliefs, Conversation/Discourse Analysis, Educational Psychology, Emotion and Affect, Parental Involvement in Learning, Quantitative Methods, Vocational Education

Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education

Chairperson: Lionel Alvarez, Switzerland

Self-efficacy and outcome expectations of adolescents with (non)-stereotypic career choices

Keywords: Attitudes and Beliefs, Conversation/Discourse Analysis, Educational Psychology, Vocational Education

Presenting Author: Gernot Dreisiebner, University of Graz, Austria; **Co-Author:** Michaela Stock, School of Business Economics and Social Sciences, Austria

This research addresses the domain of gender segregation within career choices of young adults. In various European countries, at the age of 15, future apprentices decide on one of approximately 200 apprenticeship trades. With regard to this career decision, gender-stereotypical patterns become apparent: Craftsmanship and technical trades are mostly male-dominated, whereas commercial and administrative trades represent female-dominated vocational fields. Only a small group of adolescents manages to successfully set foot in non-gender-stereotypical domains. The aim of the presented study is to provide an in-depth description of this particular group. Therefore, a qualitative methodology with foundations in social reconstructive research is applied. The results suggest four types of career choice processes. Only adolescents of type I (which showed a high amount of self-autonomy) were able to overcome stereotypic career choices. The qualitative results are then triangulated with a long-term quantitative study (Paechter et al., 2017). The results of the triangulations suggest, that it is possible to identify problematic career choice processes from adolescents at an early stage (while they are still at school) both with qualitative as well as quantitative research designs. The possibility of specifically addressing these groups (e.g. via enabling further learning experiences) underlines the theoretical and educational significance of the topic.

Expectancy-value theory and emotions in a COVID world: a study on vocational teachers

Keywords: Attitudes and Beliefs, Emotion and Affect, Quantitative Methods, Vocational Education

Presenting Author: Catherine Audrin, University of Teacher Education Lausanne, Switzerland; **Co-Author:** Marine Hascoët, University of Teacher Education Lausanne, Switzerland; **Co-Author:** Crispin Girinshuti, University of Teacher Education Lausanne, Switzerland

This paper presents a study conducted with 324 university students and investigates how their perceived competence, interest, cost, importance and utility toward their study may predict the achievement emotions felt during studying. The students filled out an online questionnaire on their perception of their work environment during the COVID period. The results show that perceived competence and interest positively predict positive emotions and negatively predict negative emotions. More specifically, perceived competence positively predicts pride, while interest positively predicts joy, hope, and relief. In contrast, perceived competence negatively predicts shame, anxiety and hopelessness, while interest negatively predicts anger and hopelessness. Interestingly, cost significantly predicted negative emotions (i.e. anger, anxiety and hopelessness), while importance and utility were not significantly related to any emotions. The results confirm the importance of aspects of expectancy-value as possible antecedents of positive emotions felt in a context of learning and achievement. Interestingly, our results suggest that specific dimensions of expectancy-value related to prospective factors (i.e., utility and importance) may not be involved in achievement emotions.

Role of the school context in parental expectations' development

Keywords: Attitudes and Beliefs, Educational Psychology, Parental Involvement in Learning, Quantitative Methods

Presenting Author: Marine Hascoët, Lausanne University of Teacher Education, Switzerland; **Co-Author:** Valentina Giacconi, Universidad de O'Higgins, Chile; **Co-Author:** Ludivine Jamain, Université Grenoble Alpes, France

Parental expectations could be considered as the best indicator of parental involvement for a child's educational success. They are mainly explained by the characteristics of students and their families. Recent researches encourage a better consideration of the school or country characteristics. Our study was carried out in Chile, a country with high school segregation. The objective was to test a multi-level model explaining parental Chilean expectations integrating individual, familial and school factors. We used a semi-longitudinal design, and our study sample (N= 134,926 Chilean students) came from a national assessment that was conducted in 2015 and 2017, when students were in their 8th and 10th grades. Our results showed that while individual characteristics and family context were linked to the development of parental expectations, the school environment also has a role to play in their construction. In Chile, the parents with lower socio-economic resources send their children to more disadvantaged schools. Children with low family socio-economic resources are doubly penalized: their parents had low expectations due to their socio-economic level and due to the school they can send their children.

Session X 4

27 August 2021 12:00 - 13:00

Session Room 12

Single Paper

Developmental Aspects of Instruction

Mathematics in Primary Education

Keywords: Cognitive Development, Cognitive Skills, Mathematics, Primary Education, Problem Solving, Psychometrics, Student Learning

Interest group: SIG 17 - Methods in Learning Research

Chairperson: Christian Thurn, ETH Zurich, Switzerland

Development of children's strategy use from Grade 3 to 4: Individual and classroom predictors

Keywords: Cognitive Development, Mathematics, Primary Education, Psychometrics

Presenting Author: Henning Sievert, Leibniz-Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:** Marian Hickendorff, Leiden University, Netherlands; **Co-Author:** Ann-Katrin Van der Ham, Universität Hamburg, Germany; **Co-Author:** Aiso Heinze, Leibniz Institute for Science and Mathematics Education (IPN), Germany

Educational research has brought up a growing body of studies on students' strategy flexibility in arithmetic in the last two decades. Despite a broad consensus on the importance of this learning goal and several insights into the effectiveness of different teaching approaches, our knowledge of the development of strategic competence in primary school is limited. Using a multilevel latent transition analysis, we examined the development of strategy flexibility in addition and subtraction problems of 1947 students from the end of Grade 3 to the end of Grade 4. Initial results indicate that there were five different strategy profiles with different prevalences in Grade 3, and heterogeneous trajectories from Grade 3 to Grade 4. Individual and classroom covariates seem to affect the probability of strategy profile affiliation and partly the transitions between Grade 3 and 4.

The Effect of Problem Format on Second Grade Children's Arithmetic Problem-Solving Performance

Keywords: Cognitive Skills, Mathematics, Primary Education, Problem Solving

Presenting Author:Iro Xenidou-Dervou, Loughborough University, United Kingdom; **Co-Author:**Emine Simsek, Loughborough University, United Kingdom; **Co-Author:**Johannes Van Luit, Utrecht University, Netherlands; **Co-Author:**Evelyn Kroesbergen, Radboud University, Netherlands; **Co-Author:**Ilona Friso-van den Bos, University of Twente, Netherlands; **Co-Author:**Menno van der Schoot, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Ernest C. D. M. van Lieshout, Vrije Universiteit Amsterdam, Netherlands

In children's books and textbooks arithmetic problems often include illustrations. It remains unknown how different problem formats and types of illustrations influence children's arithmetic problem-solving performance. Two hundred and ninety-four 7- to 9-year-old (second grade) children completed booklets with arithmetic problems presented in five different formats with increasing levels of element interactivity: 1) *symbolic*, 2) *bare word problems*, 3) *word problems* accompanied by an *unhelpful* illustration, 4) *word problems* accompanied by a *helpful* illustration and lastly 5) *word problems* accompanied by an illustration with *essential* information. We also explored which cognitive skills, domain-general (e.g., working memory) and mathematics-specific skills (e.g. nonsymbolic and symbolic processing and estimation skills) uniquely predict children's performance on these five different arithmetic problem formats. Our results verify and extend past research. Overall, we found that the format of an arithmetic problem influences children's problem-solving performance and the type of information included in illustrations is crucial. Symbolic, bare word problems and word problems with illustrations that include helpful information were the easiest for children. But word problems with unhelpful and especially essential information in their illustrations lead to decreased performance. Further, we found that different constellations of domain general and mathematics-specific skills predicted performance across the different types of arithmetic problem formats.

Solving addition tasks within 20 – Strategy use, error rates and preconditions

Keywords:Cognitive Skills, Mathematics, Primary Education, Student Learning

Presenting Author:Hedwig Gasteiger, Osnabrück University, Germany

Fluency and the use of strategies are important aims for teaching addition within 20. Counting is a first approach for children to solve addition tasks, but in the long term, counting is seen as time consuming and error-prone. By now, there is little evidence on how children really solve addition tasks at the end of grade 2, how error-prone different strategies are, and on relations between children's knowledge of basis-facts (within 10) and their strategy use. With an explorative study we tried to get insight in these open questions. Results provide indications that most of the children use sustainable strategies, that their knowledge of basis-facts is related to strategy use, and that error rates of strategies differ.

Session X 5

27 August 2021 12:00 - 13:00

Session Room 3

Single Paper

Assessment and Evaluation

Assessment in Primary Education

Keywords:Assessment Methods and Tools, Educational Policy, Mathematics, Primary Education, Quantitative Methods, Reading Comprehension

Interest group:SIG 01 - Assessment and Evaluation

Chairperson:Andreas Rieu, PH Freiburg, Germany

Supporting primary students' math reasoning: Formative feedback and self-efficacy as mediator

Keywords:Assessment Methods and Tools, Mathematics, Primary Education, Quantitative Methods

Presenting Author:Robbert Smit, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Patricia Bachmann, University of Teacher Education St.Gallen, Switzerland

Mathematical reasoning is a difficult competence for teachers and students, and although standards have been introduced all over the world reasoning is seldom practiced in classrooms. Productively engaging students in discourse about mathematical reasoning is a challenge, and the process of classroom embedded formative feedback might increase its effectiveness. However, research has shown that the relationship between formative feedback and achievement is rather indirect, e.g. conveyed through student beliefs. We examined whether teachers' formative feedback, as part of a 10-week student training program, supported the development of reasoning competence via self-efficacy beliefs among 1261 students in 7th and 8th grade primary classes. We used multi-level modelling to analyse the expected relationships. On the class level, formative feedback predicted mathematical reasoning competence, mediated by self-efficacy; on the individual level, formative feedback predicted self-efficacy, but not mathematical reasoning competence. The results only partially confirmed our hypotheses, and we discuss explanations for this. Implications for teaching mathematical reasoning and the use of classroom embedded formative feedback are presented.

Students' (in)consistent performance and the relation with SES, gender, and track recommendations

Keywords:Educational Policy, Mathematics, Primary Education, Reading Comprehension

Presenting Author:Anne van Leest, Utrecht University, Netherlands; **Co-Author:**Janneke van de Pol, Utrecht University, Netherlands; **Co-Author:**Jan van Tartwijk, Utrecht University, Netherlands; **Co-Author:**Lisette Hornstra, Utrecht University, Netherlands

Background. It may be more difficult for teachers to formulate a track recommendation for students who perform inconsistently across different subject domains, as their performance will not point directly to one specific level of secondary education. In addition, inconsistency of performance may occur more often among specific groups of students.Aims. The aim of this study was to examine to what extent inconsistency of performance between mathematics and reading comprehension occurs, how this is associated with students' socio-economic background (SES) and gender, and with track recommendations.Sample. The sample consisted of 4,248 grade 6 students from 101 Dutch primary schools.Methods. Data were gathered via an online student monitoring platform and were analysed using two-level multilevel models. Results. Almost 20% of the students performed inconsistently across the subject domains (≥ 1 SD difference). Students' inconsistency of performance played a minor role in teachers' track recommendations, except when the inconsistency was large. Especially when students' reading comprehension was much lower than their mathematics performance, students received lower track recommendations than students with smaller inconsistencies. Conclusion. Overall, the results indicated that inconsistency of performance only played a role in teachers' track recommendations when the inconsistency was large. In other cases, students' general prior performance (i.e., aggregated over math and reading comprehension) mainly determined students' track recommendations.

Online assessment of morphological awareness and its development in grades 2-4

Keywords:Assessment Methods and Tools, Primary Education, Quantitative Methods, Reading Comprehension

Presenting Author:Szilvia Varga, John von Neumann University, Hungary

The aim of this research was to construct an online instrument to assess different aspects of morphological awareness and to examine its development in grades 2-4 in Hungarian children. The number of students in grades 2-4 was 1,310, 1,291, and 1,533 respectively, altogether 4,134 students were tested. The final test contained 59 items and consisted of five subtests: identification of affixes for real words, compound words, derivation, identification of affixes with nonwords and morpheme segmentation (each contained 12 items, expect morpheme segmentation: 11 items). The testing procedure took place in a group setting in schools ICT labs using the eDia platform. The Cronbach's alpha values of the instrument were good or acceptable, ranged between .61 and .93. The confirmatory factor analyses showed that the 5-dimensional model based on the subtests showed good model fit, and fit significantly better than the 1-dimensional model in all grades. The magnitudes of the standard deviations showed that the test has a sufficient distinguishing power in all grades. The results showed an increase in performances in all subtests. This online assessment tool for morphological awareness proved to be reliable and valid in terms of construct validity. The instrument is a useful, easy-to-use tool for teachers to get detailed information about children's morphological skills. These results gave evidence that morphological awareness develops and works similarly in a shallow orthography language as it does in deep orthography languages. Further research is needed to explore the relationship between the different dimensions of morphological awareness and reading skills.

Session X 6

27 August 2021 12:00 - 13:00

Session Room 10

Single Paper

Instructional Design

Computer-assisted and Multimedia Learning

Keywords: Computer-assisted Learning, E-Learning/Online Learning, Instructional Design, Metacognition, Multimedia Learning, Technology

Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Eleni Kyza, Cyprus University of Technology, Cyprus

Modality effect in virtual reality

Keywords: Computer-assisted Learning, Instructional Design, Multimedia Learning, Technology

Presenting Author: Patrick Albus, Ulm University, Germany; **Co-Author:** Andrea Vogt, Ulm University, Institute of Psychology and Education, Department Learning and Instruction, Germany; **Co-Author:** Tina Seufert, Ulm University, Germany; **Co-Author:** Sebastian Hartwig, Institute of Media Informatics, Germany

Virtual reality (VR) learning environments are highly visual and need instructional aid to help the learner in selecting and organisation processes. In VR learning environments, an auditory presentation of additional instructional text could be particularly beneficial due to the many visual stimuli and the risk of working memory overload. Based on the modality principle, it is therefore assumed that an audio-visual presentation in VR, compared to a visual-only presentation, can lead to higher learning outcomes (recall, comprehension and transfer), is less straining and might relieve learners' resources for germane processing. In a between-subjects design we analysed the modality principle in VR with 61 subjects (69% female). We hypothesized that when verbal information in VR is given auditorily instead of visually, it leads to higher learning outcome, lower extraneous cognitive load and higher germane cognitive load. However, results show a reverse modality effect. The visual-only group showed higher post-test scores on recall and comprehension but not on transfer. We found no differences in extraneous cognitive load but higher germane cognitive load for the visual-only group, which may be attributed to repeated reading or reading strategies. Future research could focus on the use of strategies or evaluate relevant process data.

Can segmented lecture slides foster online learning?

Keywords: Computer-assisted Learning, E-Learning/Online Learning, Instructional Design, Multimedia Learning

Presenting Author: Tim Kühl, University of Mannheim, Germany; **Co-Author:** Susanne Kappes, University of Mannheim, Germany

Not only since the coronavirus pandemic, the importance of online learning through lectures has increased. In the present study it was investigated whether online learning can be improved when lecture slides are segmented. It was assumed that segmented compared to non-segmented slides would foster learning, reduce mind wandering, reduce extraneous cognitive load (ECL), and increase germane cognitive load (GCL). To test this, 102 University students were randomly assigned to either a segmented condition or a non-segmented condition. In the segmented condition, students were given lecture slides on which the written information (e.g., text in bullet points) was presented in a step-by-step and segmented manner whenever it was mentioned in the accompanying oral explanation. In the non-segmented condition, students were given slides on which, for each slide, all written information was presented at once when the oral explanation started. Other than expected, results showed no significant influence of segmenting compared to not segmenting slides on any of the dependent variables: neither on the learning outcome measures of retention and transfer, nor on the subjective ratings of mind wandering, ECL, or GCL. Hence, these results suggest that segmenting lecture slides may not be a sufficient technique to improve learning. However, this conclusion may be premature since limitations of the study might explain a missing effect. These limitations are being discussed and might pave the way for further research.

Do a rating task and a pause button affect video-based learning? Insights from two experiments.

Keywords: Computer-assisted Learning, Instructional Design, Metacognition, Multimedia Learning

Presenting Author: Martin Merkt, Deutsches Institut für Erwachsenenbildung, Germany; **Co-Author:** Daniel Bodemer, University of Duisburg-Essen, Germany

While contributing to the increased popularity of video-based learning, the perceived easiness of videos also results in suboptimal learning outcomes that is often explained by lacking or inaccurate metacognitive monitoring processes. In this set of experiments, we investigated whether a task asking learners to rate videos regarding their suitability to convey the contents (both experiments) and the availability of a pause button (Experiment 2) benefitted learning by fostering metacognitive monitoring and enabling metacognitive control processes. In both experiments, participants watched three educational videos with different task instructions (rating task vs. watch attentively) before predicting their performance in a subsequent knowledge test and filling in the knowledge test. In Experiment 1 (68 participants, $M_{age} = 23.07$, laboratory study), the rating task resulted in more accurate judgments of learning, but had a negative effect on the learning outcomes. This pattern of results was not replicated in Experiment 2 (168 participants, $M_{age} = 52.91$, online study) in that we additionally varied whether participants could pause the video. However, the availability of the pause button resulted in more accurate JOL, corroborating findings from previous research. The mixed evidence regarding the effects of the rating task across the two studies is discussed with regard to the different settings as well as the different samples that were used in the two experiments.

Session X 7

27 August 2021 12:00 - 13:00

Session Room 17

Single Paper

Educational Policy and Systems, Learning and Special Education

School Effectiveness

Keywords: Educational Policy, Primary Education, Qualitative Methods, School Effectiveness, Special Education, Teacher Professional Development

Interest group: SIG 15 - Special Educational Needs, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Monika Gigerl, Austria

Reform@work: Analyzing policy implementation under the impact of COVID-19 in Switzerland

Keywords: Educational Policy, Qualitative Methods, School Effectiveness, Teacher Professional Development

Presenting Author: Michelle Jutzi, University of Teacher Education Bern, Switzerland; **Co-Author:** Marina Grgic, Pädagogische Hochschule Bern, Switzerland; **Co-Author:** Thomas Wicki, PHBern, University of Teacher Education, Switzerland; **Co-Author:** Ueli Hostettler, PHBern – University of Teacher Education, Switzerland

This paper tries to uncover patterns in the process of the ongoing digital transformation of public schools in Switzerland. Not only because of the current increase of digitalization triggered by the COVID-19 pandemic, but already years before, Swiss authorities placed utmost importance to the curriculum of a new subject called "media and informatics" (M&I). Although the 21 German-speaking cantons have decided to adopt the national curriculum, every canton has the right to put their own interpretation of M&I into practice. Public schools in Switzerland are owned and run on the municipal level, which adds another important actor in the process of education reform. The empirical foundation of this study includes a corpus of documents and expert interviews focusing on both the national and cantonal levels. The content analysis shows that the regional authorities have developed their own visions of digital transformation, support systems for teacher education and the role of communities and principals in school development. It also showed considerable variation in resources and infrastructure at the municipal level. Furthermore, the interviews highlight that schools reacted differently to the COVID-19 pandemic. The experts suggest that

the upgrade of technical equipment in schools may not go hand in hand with a lasting form of digital transformation. We will present recommendations on which strategic tools may be used on a national level to streamline the development, where possible, and at the same time address local variation as well as questions of educational inequality in public schools.

Enacting an RCT on small-group mathematics tuition in elementary schools: practitioners' voices

Keywords: Educational Policy, Primary Education, Qualitative Methods, School Effectiveness

Presenting Author:Jarmila Bubikova-Moan, Kristiania University College, Norway; **Co-Author:**Vibeke Opheim, NIFU, Norway

In this paper, we critically examine how a randomized control trial (RCT) on small-group tuition in mathematics in Norwegian lower-elementary schools was experienced "on the ground". Based on interviews with key policy agents at six participating schools, teachers and school principals, we show that despite much agreement on the pedagogical merits of small-group tuition, enacting the RCT in practice created multiple challenges that the schools addressed in their unique ways. We argue that safeguarding local flexibility vis-à-vis imposed rigidity, multiple policy demands and changing circumstances are key to consider in planning, designing and committing to interventional research in educational policy settings.

Primary school principals' views on designing inclusive schools

Keywords: Primary Education, Qualitative Methods, School Effectiveness, Special Education

Presenting Author:Gamze Görel, Paderborn University, Germany; **Co-Author:**Frank Hellmich, Paderborn University, Germany

The ratification of the UN-convention on the Rights of Persons with Disabilities has led to various challenges at school level. Regular schools are undergoing transformation processes in order to offer appropriate learning environments for all students and to meet their individual needs. Within the frame of implementing inclusive education, the question arises, how to realise inclusion at school in the best possible way. Against this background, the purpose of our study is to find out necessary requirements for a successful implementation of inclusive education from the principals' point of view, who are regarded as a key component in the context of inclusive school development (Ainscow, Dyson & Weiner, 2013). Therefore, individual interviews based on an interview guide were carried out with $N=32$ German primary school principals. For the analysis of the data, the 'Grounded Theory' (Corbin & Strauss, 2008) approach was applied. The findings of the study indicate that personnel, financial and material resources as well as building infrastructure are perceived as the most crucial conditions for a successful realisation of inclusive education. However, the responses of some principals make clear, that aspects such as additional teaching material and infrastructure are not perceived as decisive as the additional personnel in terms of both quality and quantity. Furthermore, the importance of positive attitudes towards inclusion was highlighted. The findings indicate the priority of certain measures and the lack thereof can impede a successful realisation of inclusive education.

Session X 8

27 August 2021 12:00 - 13:00

Session Room 13

Single Paper

Developmental Aspects of Instruction, Learning and Special Education

Developmental Processes in Early Childhood Education

Keywords: At-risk Students, Developmental Processes, Early Childhood Education, Learning Technologies, Primary Education, Reading Comprehension, Writing/Literacy

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 12 - Writing

Chairperson: Jessica Carolyn Bühler, University of Basel, Switzerland

Writing for all: Studying the development of handwriting and keyboarding skills in early education

Keywords: Developmental Processes, Early Childhood Education, Learning Technologies, Writing/Literacy

Presenting Author:Anabela Malpique, Murdoch University, Australia, Australia; **Co-Author:**Margaret Merga, Edith Cowan University, Australia; **Co-Author:**Deborah Pino-Pasternak, University of Canberra, Australia; **Co-Author:**Susan Ledger, Murdoch University, Australia; **Co-Author:**Debora Valcan, Murdoch University, Australia

In today's digital world, children are expected to produce handwritten and computer-generated work to assess content knowledge across subjects and years. Considering the continuing digital revolution in education and learning, the *Writing for All* project was designed to investigate Year 2 students' abilities, motivation, engagement and self-efficacy in composing texts via handwriting and keyboarding and teaching practices promoting effective writing. This study describes findings from the pilot phase of the project involving 49 children from two primary schools in Western Australia. We assessed children's handwriting and keyboarding performance for composing short stories (i.e., letter writing automaticity; writing quality; text length; and spelling), as well as children's motivation, engagement, and self-efficacy in writing stories using paper and pencil and using a keyboard. Finally, Year 2 teachers were surveyed on the amount and type of writing instruction developed in children's classrooms. We found moderate to strong correlations between the quality and the length of children's handwritten and typed texts, as well as strong associations between spelling outcomes and handwritten and typed texts. Overall, findings showed that children composed longer and higher-quality texts via paper and pencil than via keyboard. Results further indicated that children preferred writing stories using a computer, but they found they were better at writing using paper and pencil. Finally, teachers reported that children spent 80 minutes on average in writing activities in their classrooms each week, with results indicating that the teaching of spelling was prioritised over handwriting and typing. Implications for research and practice will be discussed.

Emerging school readiness profiles of 3-year-old typically developing children

Keywords: At-risk Students, Developmental Processes, Early Childhood Education, Primary Education

Presenting Author:Erica Kamphorst, University of Groningen, Netherlands; **Co-Author:**Marja Cantell, University Groningen, Netherlands; **Co-Author:**Gerda Van der Veer, University of Groningen, Netherlands; **Co-Author:**Alexander Minnaert, University of Groningen, Netherlands; **Co-Author:**Suzanne Houwen, University of Groningen, Netherlands

A promising approach for studying school readiness involves a person-centered (PC) approach, aimed at exploring how functioning in diverse developmental domains conjointly affects children's school outcomes. Currently, however, a systematic understanding lacks of how motor skills, in conjunction with other school readiness skills, affect a child's school outcomes. Additionally, little is known about associations of school readiness profiles to non-academic (e.g., socioemotional) skills. Therefore, we examined the school readiness skills of typically developing children ($N = 91$) with a mean age of 3 years and 4 months (46 % girls). We used a multi-informant (i.e., performance based tests and parent ratings) test battery to assess children's school readiness in terms of motor, socioemotional, language and executive function skills, as well as first grade academic and non-academic school outcomes. Preliminary findings based on a Latent Profile Analysis revealed 4 distinct school readiness profiles, characterized by between-profile differences in both level and pattern of school readiness skills. As for our specific focus on motor skills, performance on these skills differed between profiles, ranging from somewhat below- to well above average. Further testing will be aimed at distribution of background variables (e.g., gender) over profiles, and predictive validity concerning first grade school outcomes. Our findings highlight the importance of a multifaceted description of a child's school readiness, rather than summary label, such as 'average' or 'high'. Importantly, gained insights could help schools (and more generally speaking: early childhood education and care) to prepare themselves to be ready for each child's unique needs.

Reading precursors developmental trajectories according to socioeconomic status in Chile

Keywords: Developmental Processes, Early Childhood Education, Reading Comprehension, Writing/Literacy

Presenting Author:Victoria Espinoza, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Catalina Santa Cruz, Centro de Justicia Educacional, Chile; **Co-Author:**Ricardo Rosas, Psychology, Chile

There is resounding evidence of the existence of direct precursors of written language, most specifically phonological awareness, letter recognition, vocabulary, and oral comprehension. The initial differences identified in the development of written language precursors are directly related to subsequent students' academic trajectories. Socioeconomic status is a significant source of initial differences in performance, with discrepancies in the development of reading precursors favoring children from more affluent backgrounds. We assessed reading precursors in 164 children from different socioeconomic levels. Significant differences in performance were found, which tended to favor the higher socioeconomic groups for each precursor we tested. However, the developmental trajectories of skills were similar for phonological awareness, letter recognition, vocabulary, and oral comprehension. A compensatory trajectory was observed only in the case of rapid naming. The problem arises from the need for educational systems to adapt to the specific needs of their students, in order to generate compensatory trajectories in all reading precursor skills and enable a decrease in the gaps in reading performance among children from different socioeconomic backgrounds.

Session X 9

27 August 2021 12:00 - 13:00

Session Room 18

Single Paper

Learning and Instructional Technology, Teaching and Teacher Education

Computer-assisted Learning in Pre-service Teacher Education

Keywords: Attitudes and Beliefs, Competencies, Computer-assisted Learning, Higher Education, Interdisciplinary, Misconceptions, Pre-service Teacher Education

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education

Chairperson: Birgitta Fröjdendahl, Sweden

Pre-service teachers' conceptions on online learning in emergency distance education

Keywords: Attitudes and Beliefs, Computer-assisted Learning, Higher Education, Pre-service Teacher Education

Presenting Author: Christian Tarchi, University of Florence, Italy; **Co-Author:** Eva Wennås Brante, Malmö University, Sweden; **Co-Author:** Mohammad Jokar, Monash University, Australia; **Co-Author:** Elham Manzari, Monash University, Australia

In the first months of 2020, the COVID-19 crisis brought several changes in higher education settings, by rapidly accelerating a transformation towards digital and online learning. We investigated university students' conceptions of online learning during the transition from face-to-face to online learning in three countries (Italy, Sweden and Iran). Through a questionnaire, we asked students to describe the online courses that they have attended, and to define online learning (a term we prefered to distance education or similar as it is more familiar to students), associated abilities and differences between online and face-to-face learning. Participants were 218 pre-service teachers (83 Italian university students, 41 Swedish university students, and 104 Iranian university students). All questions were asked in the participants' first language. Participants' answers were coded by trained raters. According to the main results, most of the participants simply defined online learning as learning through the use of technology and at distance. Particularly concerning is the fact that participants compared the two learning environments in terms of tools (i.e., use of ICT) but not in terms of pedagogy. Participants reported that online learning facilitates management skills, but face-to-face learning facilitates attention. Moreover they considered face-to-face learning as the best environment for group interactions and communication. On the relationship-level, face-to-face learning was perceived as a more emotional environment than online learning. In conclusion, the results of the study reveal rather unsophisticated conceptions of online learning, warranting for attention to self-regulated learning when implementing online learning in higher education settings.

Learning to diagnose: effects of scaffolding in a simulation for prospective primary school teachers

Keywords: Competencies, Computer-assisted Learning, Misconceptions, Pre-service Teacher Education

Presenting Author: Christian Schons, Technical University of Munich, Germany; **Co-Author:** Andreas Obersteiner, Technical University of Munich, Germany; **Co-Author:** Kristina Reiss, Technische Universität München (TUM), Germany

Teachers' diagnostic competences include an ability to detect pupils' mathematical misconceptions based on their written work. We developed a simulation that aimed at fostering these competencies in prospective teachers, using two different types of scaffolds. Domain-specific scaffolds supported prospective teachers' pedagogical content knowledge; domain-general scaffolds supported prospective teachers' knowledge about diagnostic reasoning. In an experimental pre-post-test design, 62 prospective primary school teachers were assigned to one of the two scaffolding groups and worked with the simulation for 60 minutes.

Preliminary results suggest that, as expected, domain-specific scaffolds are more effective than domain-general scaffolds regarding their ability to detect pupils' misconceptions.

How professional knowledge affects teachers' diagnoses of students' scientific reasoning skills

Keywords: Computer-assisted Learning, Higher Education, Interdisciplinary, Pre-service Teacher Education

Presenting Author: Amadeus J. Pickal, University of Hildesheim, Germany; **Co-Author:** Raimund Girwidz, LMU Munich, Germany; **Co-Author:** Birgit J. Neuhaus, LMU Munich, Germany; **Co-Author:** Christof Wecker, Universität Hildesheim, Germany

This study focuses on verifying the crucial role of teachers' professional knowledge for diagnosing students' individual skills. Hereby we are extending existing research on teachers' diagnostic competences by considering the importance of diagnosing cross-domain skills – namely scientific reasoning skills. For this matter, we tested pre-service teachers' own scientific reasoning skills, domain knowledge and knowledge about the structure and diagnosis of scientific reasoning skills. Additionally, we used video-based simulations depicting a classroom situation with two students experimenting with different variables in a biology or physics lesson for evaluating pre-service teachers' accuracy in diagnosing students. Our results only partially underline the expected significance of professional knowledge for diagnosing students' scientific reasoning skills as only pre-service teachers' own scientific reasoning skills affect the accuracy of their diagnoses.

Session X 10

27 August 2021 12:00 - 13:00

Session Room 6

Single Paper

Higher Education, Learning and Instructional Technology

Computer-assisted Learning Technologies

Keywords: Computer-assisted Learning, Higher Education, Instructional Design, Learning Analytics, Learning Technologies, Motivation

Interest group: SIG 06 - Instructional Design, SIG 27 - Online Measures of Learning Processes

Chairperson: Boris Eckstein, University of Teacher Education St. Gallen, Switzerland

Online measures of learning engagement: patterns in time and relationships with off-line measures

Keywords: Computer-assisted Learning, Learning Analytics, Learning Technologies, Motivation

Presenting Author: Dirk Tempelaar, Maastricht University, Netherlands

The measurement of learning engagement is a major research theme, both in the learning analytics community and the broader area of educational research. The complexity of conceptualizing as well as operationalizing the construct of engagement generates a wide range of instruments, such as self-report surveys, log data from technology-enhanced learning systems, think-aloud and tests. In this empirical work, we investigate the alignment of behavioural traces of

engagement with self-report measures and their impact on academic performance. The unique contribution of this study was the integration of temporal, behavioural, affective, and cognitive dimensions of engagement by combining digital traces at three different learning phases with self-report, formative as well as summative assessments. Using a two-step cluster analysis based on data from 1,027 undergraduate students in a first-year 8-week statistics course, we identified four distinct temporal engagement patterns (i.e. non-active, active before tutorial, active before quiz, and active before exams). Our analysis showed that early engagement (i.e. before tutorial) was significantly associated with course performance and self-report measures, while late engagement patterns had weaker correlations. This study shed further lights on a potential source of heterogeneity and collinearity in engagement measures (i.e. timing of engagement) that should be accounted for in learning analytics model. In order to design effective intervention, it is crucial to consider different profiles of learners based on their engagement patterns as well as the temporal relation between trace data, self-report, and academic performance.

Learners' Adjustment Strategies Following Impasses in Medical Simulations

Keywords: Computer-assisted Learning, Higher Education, Instructional Design, Learning Technologies

Presenting Author:Nicole Heitzmann, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Matthias Stadler, LMU Munich, Germany; **Co-Author:**Anika Radkowitsch, Ludwig-Maximilians-Universität München, Germany; **Co-Author:**Constanze Richters, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Ralf Schmidmaier, LMU University Hospital Munich, Germany; **Co-Author:**Martin R. Fischer, LMU University Hospital, Germany

Simulations offer adjustment strategies that are not available in regular practice, such as further evidence generation or reflection with less time pressure after an impasse. The way learners utilize these adjustment strategies likely depends on their prior knowledge. In this study, we analyse (1) the differences in adjustment strategies after impasses of learners with different prior knowledge and (2) how learners adapt their adjustment strategy during learning with simulations. We used a medical simulation in which experienced participants diagnosed patients by examining their health record and requesting radiologic evidence. We used a one-factorial design with learners on three levels of prior knowledge (low-medium-high). To gain insights into changes of learner's adjustment strategy during the course of learning we employ exploratory analysis using configurational frequency analysis. Learners with intermediate or low prior knowledge were most likely to use evidence generation. In a logistic regression model with evidence generation and prior knowledge predicting the likelihood of an accurate diagnosis there was a significant interaction between the predictors. The likelihood of an accurate diagnosis decreased with more evidence generation for learners with high and low prior knowledge whereas it increased for learners with intermediate prior knowledge. The same adjustment strategy following an impasse can be helpful for specific learners but have negative consequences for learners with other learning prerequisites. Most learners make use of additional opportunities for learning after impasses in simulations yet without recognizing the value and challenges of individual strategies, the potential of simulated learning environments is not fully exploited.

Learning from Gaze: Eye Movement Modeling Examples in Software Engineering Education

Keywords: Computer-assisted Learning, Higher Education, Instructional Design, Learning Technologies

Presenting Author:Kenneth Holmqvist, Lund University, Sweden; **Presenting Author:**Mottok Jürgen, OTHR, Germany; **Co-Author:**Theresa Stark, OTH Regensburg, Germany; **Co-Author:**Stefan Schreitetter, OTH Regensburg, Germany; **Co-Author:**Rebecca Reuter, OTH Regensburg, Germany; **Co-Author:**Florian Hauser, OTH Regensburg, Germany; **Co-Author:**Hans Gruber, University of Regensburg, Germany

In the domain of software engineering, students are known to have difficulties in learning UML (Unified Modeling Language), which is substantial in abstracting natural language requirements into a software model. Difficulties tend to reflect the complexity and the high degree of abstraction inherent in UML diagrams. We investigated whether a specific kind of video-based modeling examples, namely EMMEs (Eye Movement Modeling Examples), are a good tool for supporting students' learning processes. EMME videos were created by recording eye-movements and voice from an expert creating an UML sequence diagram. In this study, the control group was exposed to the unaltered video while the experimental group received the video augmented with the expert's gaze. We examine the acceptance of EMMEs and the effect on students' performance, depending on their prior knowledge. We were able to confirm that novices followed the gaze of the model and that EMMEs were beneficial for learning UML, primarily for learners with lower prior knowledge.

Session X 11

27 August 2021 12:00 - 13:00

Session Room 2

Single Paper

Learning and Special Education, Motivational, Social and Affective Processes, Teaching and Teacher Education

Achievement

Keywords: Achievement, Educational Psychology, Goal Orientation, Metacognition, Motivation and Emotion, Qualitative Methods, Secondary Education, Social Interaction, Special Education, Teaching Approaches

Interest group: SIG 11 - Teaching and Teacher Education, SIG 16 - Metacognition, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Izzet Utku Caybas, Middle East Technical University, Turkey

Associations among students' achievement goals, perceived teachers' goals and didactic practices

Keywords: Achievement, Goal Orientation, Qualitative Methods, Teaching Approaches

Presenting Author:GEORGIA STAVROPOULOU, Aristotle University of Thessaloniki, Greece; **Co-Author:**Dimitrios Stamovlasis, Aristotle University of Thessaloniki, Greece; **Co-Author:**Eleftheria Gonida, Aristotle University of Thessaloniki, Greece

Abstract Didactic practices that a teacher uses in class can influence students' attitudes, behaviors and learning outcomes. The aim of this study was to investigate the relations among perceived didactic practices, perceived teachers' goals and students' achievement goal orientations using a person-centered approach. The participants were senior high-school students ($N=703$) who responded to self-report questionnaires measuring perceived teacher goals in the classroom (mastery, performance-approach, performance-avoidance), students' achievement goals orientation (mastery, performance-approach, performance-avoidance) and perceived didactic practices (teacher-centered or constructivist approaches) along with their achievement scores in language and GPAs. A person-centered approach was adopted by implementing Latent Class Analysis (LCA) based on the students' three goal related variables. The resulted four latent classes or latent profiles as dependent variables were predicted by perceived teachers' goals, while as independent variables they predicted the perceived didactic practices in language. The results revealing the mediating role of students' goal orientations support previous evidence. The mastery goal profile was the most adaptive one in relation to the use of the constructivist didactic approach, a finding that advocates the crucial role of teachers' goals in the classroom towards mastery or performance and the consistent adaptive functioning of teachers' emphasis on mastery.

The Role of Metacognitive Competences in the Development of School Achievement among Gifted Youths

Keywords: Achievement, Metacognition, Secondary Education, Special Education

Presenting Author:Catharina Tibken, University of Würzburg, Germany; **Co-Author:**Tobias Richter, University of Würzburg, Germany; **Co-Author:**Sandra Schmiedeler, University of Würzburg, Germany; **Co-Author:**Nicole von der Linden, University of Würzburg, Germany; **Co-Author:**Wolfgang Schneider, University of Würzburg, Germany

Gifted underachievers perform worse in school than would be expected based on their high cognitive abilities. Possible causes for underachievement are low metacognitive competences and motivational dispositions (e.g., need for cognition). This study tested the interplay of these variables longitudinally (two measurement points, nearly one school year apart) with gifted students ($N = 129$, 58 female) in Grade 6 ($M = 12.04$ years at t1) and Grade 8 ($M = 13.97$ years at t1). Declarative and procedural metacognitive competences were both assessed in the domain of reading comprehension, using a reading strategy questionnaire for declarative metacognitive competences and an inconsistency paradigm for procedural metacognitive competences. Path analyses showed incremental effects of procedural metacognitive competences over and above intelligence on the development of school achievement in gifted students ($\beta = 0.139$). Moreover, declarative metacognitive competences and need for cognition interactively predicted procedural metacognitive competences ($\beta = 0.169$) that mediated their effect on school achievement. In conclusion, the results of the present study offer a new perspective on the development of school achievement

in gifted adolescents and on the causation of gifted underachievement and, thus, on possible approaches to prevent underachievement as they reveal mechanisms of how low metacognitive competences might explain the development of gifted underachievement.

Adolescents' Subjective Well-being with respect to school-related factors across 48 countries

Keywords: Achievement, Educational Psychology, Motivation and Emotion, Social Interaction

Presenting Author:Yi-Jhen Wu, Institute for School Development Research (IFS), TU Dortmund, Germany; **Co-Author:**Jihyun Lee, UNSW-Sydney, Australia

Well-being studies have identified relevant factors for adolescents. However, most studies only focused on a narrow number of countries and populations and used a limited number of contextual factors. In this study, we aimed to investigate many school-related factors on subjective well-being (SWB) in the adolescents' population across 48 countries. Demographic variables, science performance, achievement motivation, test anxiety, and social support from peers, teachers, and parents from Programme for International Student Assessment (PISA) 2015 were used to predict SWB using a decision tree analysis. The results consistently showed that test anxiety, support from parents and classmates were essential to students' well-being across countries. This study highlighted that social-emotional factors are essential to better SWB for adolescents.

Session X 12

27 August 2021 12:00 - 13:00

Session Room 14

Single Paper

Motivational, Social and Affective Processes

Motivation and Social Interaction

Keywords: Emotion and Affect, Motivation and Emotion, Primary Education, Quantitative Methods, Social Aspects of Learning and Teaching, Social Interaction

Interest group: SIG 08 - Motivation and Emotion, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Jessica To, National Institute of Education, Nanyang Technological University, Hong Kong

Parental Support and Pressure in Adolescents' Development of Stress

Keywords: Emotion and Affect, Motivation and Emotion, Social Aspects of Learning and Teaching, Social Interaction

Presenting Author:Stefan Kulakow, University Greifswald, Germany; **Co-Author:**Diana Raufelder, University Greifswald, Germany; **Co-Author:**Frances Hoferichter, University of Greifswald, Germany

One major stressor of adolescents relates to the pressure students perceive from their parents accompanied by high academic expectations, while in contrast parental support is related to low levels of stress. However, it is not clear whether the perceived parental pressure and support contribute to a change in students' stress level from early to middle adolescence and if there are differences among students from low vs. high track schools. This two-wave study examined the impact of perceived maternal and paternal pressure and support for students' general stress level from grades 8 to 9 among students attending high- and low-track schools by applying multigroup multilevel latent change modeling based on data from 1088 8th grade students ($M_{Age} = 13.70$, $SD = 0.53$, 53.9% girls at Time 1). Results indicate that the general stress level from early to middle adolescence increases for students from low-track schools only. This change increases even more if students from low-track schools perceive pressure from their father, whereas perceived paternal support and maternal pressure dampen the increase of stress. For students from high-track schools, perceived maternal pressure is positively and maternal support negatively related to students' stress level in grade 8. Overall, boys tend to report lower stress levels compared to girls.

Teachers' Psychobiological Stress in Social Interactions and the Role of Emotional Stability

Keywords: Emotion and Affect, Motivation and Emotion, Social Aspects of Learning and Teaching, Social Interaction

Presenting Author:Sandra Isabell Schneider, PHBern / University of Bern, Switzerland; **Co-Author:**Alexander Wettstein, PHBern / University of Bern, Switzerland; **Co-Author:**Fabienne Kühne, PHBern / University of Bern, Switzerland; **Co-Author:**Martin grosse Holtforth, University of Bern, Switzerland; **Co-Author:**Roberto La Marca, University of Zurich, Switzerland; **Co-Author:**Wolfgang Tschacher, University of Bern, Switzerland

Teachers report higher levels of chronic stress and psychosomatic illnesses compared to other professions. Teacher stress is a far-reaching problem that affects not only the teachers' health but comes along with a lower quality of teaching and high economic health costs in the long run. Teachers are continually managing complex social situations within the classroom as they lead their courses and provide learning opportunities for their students. According to teachers, the primary stress factor at work is problematic teacher-student interactions, especially when accompanied by aggressive student behaviour. We present a multidimensional ambulatory assessment study that includes the continuous and simultaneous assessment of psychological, biological and physiological stress indicators during the teachers' daily life and explores the complex and dynamic association between teacher stress, social interactions, and social relationships in the classroom. The initial findings indicate that a good teacher-student relationship from the perspective of the teacher is associated with higher life satisfaction, good teacher self-efficacy conviction and experiencing a sense of coherence.

Primary school student's perceived social support and study engagement – Three-year follow-up

Keywords: Motivation and Emotion, Primary Education, Quantitative Methods, Social Interaction

Presenting Author:Pihla Rautanen, Tampere University, Finland; **Co-Author:**Tiina Soini-Ikonen, Tampere University, Finland; **Co-Author:**Janne Pietarinen, University of Eastern Finland, Finland; **Co-Author:**Kirsi Pyhälö, University of Helsinki, Finland

A strong body of evidence shows that social support from teachers, peers and guardians contributes to study engagement (Estell & Perdue, 2013; Havik & Westergård, 2019; Kiefer et al. 2015; Quin, 2017; Roorda et al. 2011; Wang & Eccles, 2012). However, the interrelation is likely to be bidirectional: engaged students might be more eager to provide and ask for help in schoolwork (Bakker, 2011; Ouweeneel et al. 2011) and there is tentative evidence that teachers provide more emotional support for students who enjoy, value and succeed in schoolwork (Košir & Tement, 2014; Nurmi, 2012; O'Connor et al., 1993). However, to date, the bidirectional interrelations between study engagement and social support for schoolwork have not been studied sufficiently in the Finnish primary school setting. This study aims to bridge the gap in the literature by exploring the bidirectional interrelations between primary school students' perceived study engagement and social support for schoolwork from teachers, guardians and peers. A three-wave longitudinal survey data collected in the years of 2017, 2018 and 2019 from 4th to 6th graders (N=2401) is analyzed with structural equation modeling. The results indicate that study engagement is an important resource for later social support. Moreover, teacher support had a bidirectional interrelation with study engagement. Students within a certain class group became more alike over time in study engagement and social support. Girls perceived more study engagement, teacher support and peer support at 4th and 5th grades compared to boys.

Session X 13

27 August 2021 12:00 - 13:00

Session Room 11

Single Paper

Motivational, Social and Affective Processes

Motivation in At-risk Students

Keywords: At-risk Students, Attitudes and Beliefs, Developmental Processes, Emotion and Affect, Motivation and Emotion, Quantitative Methods

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Junlin Yu, University of Helsinki, Finland

Affective-motivational characteristics of at-risk children at the transition to secondary school

Keywords: At-risk Students, Developmental Processes, Emotion and Affect, Motivation and Emotion

Presenting Author: Melike Oemerogullari, University of Erlangen-Nuremberg, Germany; **Co-Author:** Michaela Gläser-Zikuda, University of Erlangen-Nuremberg, Germany

School transition has been studied extensively, especially in Germany. While most studies focused on students' cognitive development, achievement and inequalities, the development of students' affective characteristics has been widely neglected. At the transition from primary to secondary school, the curricular demands, school subjects, teachers and classmates change. Therefore, it may be expected that affective-motivational characteristics, such as school enjoyment, change because of school transition. In line with stage-environment fit theory (Eccles & Midgley, 1989), one can also expect that students with higher levels of parental support, higher educational and socio-cultural background will cope better with the transition to secondary school than disadvantaged children. In the study to be presented, we analyzed the development of students' school enjoyment, well-being in school and readiness for exertion via second-order latent growth curve models at the transition from primary to secondary school (4th to 5th grade). The analyses are based on data of the National Educational Panel Study (NEPS, starting cohort kindergarten, N = 2737, 52 % female). Results showed an increase of school enjoyment and well-being but no significant change of readiness for exertion when gender, school track, and grades in mathematics and German were controlled for. Variables characterizing at-risk students, e.g., highest ISEI, migration status, parental monitoring or perceived teacher support had no significant effect on school enjoyment and well-being. However, we found a significant effect of migration status and parental monitoring on readiness for exertion. Results, as well as methodological limitations and educational implications of the study will be discussed.

Motivational Pathways to Gifted Underachievement: Trajectory Classes and Educational Outcomes

Keywords: At-risk Students, Developmental Processes, Motivation and Emotion, Quantitative Methods

Presenting Author: Alicia Ramos, KU Leuven, Belgium; **Co-Author:** Jeroen Luijzen, KU Leuven, Belgium; **Co-Author:** Lisa Linnenbrink-Garcia, Michigan State University, United States; **Co-Author:** Bart Soenens, Ghent University, Belgium; **Co-Author:** Maarten Vansteenkiste, Ghent University, Belgium; **Co-Author:** Sabine Sypre, KU Leuven, Belgium; **Co-Author:** Michiel Boncquet, Universiteit Gent, Belgium; **Co-Author:** Karine Verschueren, KU Leuven, Belgium

This study uses a longitudinal person-centered approach to examine a developmental theory of motivational belief patterns leading to underachievement among high-ability students (Pathways to Underachievement model, or PUM; Snyder & Linnenbrink-Garcia, 2013). The PUM proposes two distinct "pathways" of maladaptive motivation: Maladaptive Competence Beliefs, characterized by vulnerable self-beliefs and beliefs about intelligence, and Declining Value Beliefs, characterized by low and declining value beliefs. The present study aimed to test the PUM by investigating (a) whether the predicted motivational pathways are evident among a sample of high-ability students (IQ ≥120) in the first two years of secondary school in Belgium (N=403, Mage = 12.2 years, 60.5% males) and (b) whether these pathways relate to students' disengagement from and underachievement in school, as assessed by the students, their parents and teachers, and school grades. Latent class growth analysis was used to specify trajectory classes of motivational development of the variables *academic self-concept*, *academic self-worth contingency*, *task value amotivation*, *entity beliefs*, and *attainment/utility value*, and outcomes were compared across classes using the BCH method. The best-fitting 3-class solution indicated an adaptive class and two maladaptive classes. The maladaptive classes largely corresponded with the predictions of the PUM. Furthermore, the trajectory classes related to the outcome variables in the expected ways, with the maladaptive classes showing higher disengagement and underachievement across multiple perspectives. These findings substantiate the PUM and provide valuable developmental insight into the multiple motivational pathways underlying disengagement and underachievement among high-ability students, providing momentum for person-centered analysis in (gifted) underachievement research.

Test Anxiety, Anxiety Disorders, and School-Related Wellbeing: The Same or Different Constructs?

Keywords: At-risk Students, Attitudes and Beliefs, Emotion and Affect, Motivation and Emotion

Presenting Author: Dave Putwain, Liverpool John Moores University, United Kingdom; **Co-Author:** Kristina Loderer, University of Augsburg, Germany; **Co-Author:** Nathaniel von der Embse, University of South Florida, United States; **Co-Author:** Shannon Suldo, University of South Florida, United States; **Co-Author:** Martin Daumiller, University of Augsburg, Germany

Previous studies have shown that highly test anxious persons are more likely to meet criteria for an anxiety disorder, and report more frequent symptoms of anxiety disorders, than their low test anxious counterparts. However, it is unclear whether test anxiety should be treated as distinct to, or a manifestation of, anxiety disorders. Furthermore, the Dual Factor Model of Mental Health proposes that high subjective wellbeing cannot be solely inferred from the absence of psychopathology. No studies, thus far, have examined the Dual Factor Model (DFM) in relation to test anxiety. In the present study, we examined how test anxiety (TA), generalized anxiety disorder (GAD), panic disorder (PD) and school-related wellbeing (SWB), were related in a sample of 918 adolescents using network analysis and latent profile analysis. Results from the network analysis showed that TA, GAD, PD, and SWB, wellbeing were represented as distinct constructs. The latent profile analysis identified three of the four profiles predicted by the DFM comprising of 'troubled' (low SWB, high TA, GAD, and PD), 'complete mental health' (high SWB, low TA, GAD, and PD), and 'symptomatic but content' (average SWB, TA, GAD, and PD). We concluded that TA was distinct to, rather than a manifestation of, GAD and PD. We found support for DFM, albeit not unequivocal, using TA as an additional indicator of psychopathology, to that of GAD and PD.

Session X 14

27 August 2021 12:00 - 13:00

Session Room 4

Single Paper

Instructional Design

Instructional Design and Comprehension of Text and Graphics

Keywords: Comprehension of Text and Graphics, Instructional Design, Learning Technologies, Mathematics, Multimedia Learning, Primary Education

Interest group: SIG 02 - Comprehension of Text and Graphics

Chairperson: Tomi Jaakkola, Finland

Bar Drawing is a Double-Edged Sword For Solving Inconsistent Word Problems

Keywords: Comprehension of Text and Graphics, Instructional Design, Mathematics, Multimedia Learning

Presenting Author: Björn de Koning, Erasmus University Rotterdam, Netherlands; **Co-Author:** Anton Boonen, Hogeschool Utrecht (University of Applied Sciences Utrecht), Netherlands; **Co-Author:** Joran Jongerling, Erasmus University Rotterdam, Netherlands; **Co-Author:** Floryt van Wesel, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:** Menno van der Schoot, Vrije Universiteit Amsterdam, Netherlands

Mathematical word problems are mathematical exercises that present the problem information as text rather than as mathematical notation. Research indicates that visually representing the variables and quantities described in a word problem in a bar drawing results in more correct answers. However, this was only shown for consistent problems wherein the relational keyword (e.g., more than) primes the appropriate operation (e.g., addition). Our study provides the first attempt to investigate the effectiveness of bar drawing for inconsistent problems wherein the relational keyword (e.g., more than) primes the inappropriate operation (e.g., subtraction). Seventy-five fifth-graders solved 24 compare word problems (12 consistent/12 inconsistent) together with an instruction to create a bar drawing for each problem. Word problem performance was scored as correct or incorrect and bar drawings were categorized as inaccurate, accurate or no drawing. Data were analyzed with multilevel logistic regressions. Results confirmed that bar drawing increases performance on consistent problems as long as accurate drawings were made. We extend prior research by showing that accurate drawings also increased performance on inconsistent problems. Interestingly, making inaccurate drawings reduced performance on inconsistent problems, more so than on consistent problems. To a lesser extent this was also true for when no drawing was made. Together, bar drawing is also an effective instructional strategy to improve performance on inconsistent problems. Compared to

consistent problems, the accuracy of bar drawings matters more on inconsistent problems as accurate bar drawings mostly result in correct answers while inaccurate bar drawings mostly result in incorrect answers.

Developing Abstraction and Diagram Use Skills for Solving Math Problems in Early Elementary School

Keywords: Comprehension of Text and Graphics, Instructional Design, Mathematics, Primary Education

Presenting Author:Yuri Uesaka, The University of Tokyo, Japan

Using diagrams is a very efficacious strategy for students in problem-solving. However, students tend to experience difficulty in using it as it demands abstraction. Examining how to cultivate a solid foundation for diagram use from an early stage in real educational contexts is essential. Thus, in this study, a new 45-minute instruction for 1st grade elementary school students was collaboratively designed between teachers and a researcher. The way to solve math word problems with diagrams was taught, and making connections between semi-concrete representations (small blocks) and abstract representations (diagrams with circles to represent people/items) was facilitated through explanations and collaborative exercises (peer interaction). The instruction was provided in two classes, which were treated basically the same except in one class semi-concrete representation (small blocks) were actively used before drawing diagrams during collaborative problem-solving. The students' performance was compared to that of a class without such instruction. The results demonstrated that both spontaneous diagram use and performance in the difficult type problems taught during the instruction were higher in the classes that received the instruction. The class performance in the extension problem was highest in the class that used semi-concrete representations in collaborative learning situations. The results suggest the importance of providing skills instruction in using representations and diagram use to young learners, and of providing them with the experience of solving problems collaboratively with semi-concrete and abstract representations, which enables them to make the link between abstract and semi-concrete representations deeply and internalize the skills more.

Learning with Dynamic Visualizations: Influence of Observing Hands, Spatial Ability, and Perspective

Keywords: Comprehension of Text and Graphics, Instructional Design, Learning Technologies, Multimedia Learning

Presenting Author:Birgit Brucker, Leibniz-Institut für Wissensmedien (IWM), Germany; **Co-Author:**Jana Adam, Eberhard Karls Universität Tübingen, Germany; **Co-Author:**Nadine Marcus, University of New South Wales, Australia; **Co-Author:**Björn De Koning, Erasmus University Rotterdam, Netherlands; **Co-Author:**Peter Gerjets, Leibniz-Institut für Wissensmedien (IWM), Eberhard Karls Universität Tübingen, Germany

Dynamic visualizations are particularly helpful for learning procedural tasks. This study investigates whether observing hand actions in dynamic visualizations from an egocentric versus an altercentric perspective is helpful for learning hand-manipulative tasks in terms of knot tying. During learning to tie two knots participants viewed dynamic visualizations with or without hands either filmed from an egocentric or an altercentric perspective (visibility of hands and perspective in a 2x2-between-subjects-design). Moreover, learners' visuospatial ability was measured as a potential moderator during learning with different types of visualizations. Participants performed a motor skills task (knot tying performance) and a cognitive task (reasoning about the knot tying process). Results on motor skills indicated that in the egocentric perspective observing hands is helpful, whereas if no hands are shown, the allocentric perspective was beneficial. Results on cognitive reasoning showed a main effect regarding the altercentric perspective. Learners' visuospatial ability was beneficial for both tasks (motor skills and cognitive reasoning) but did not interact with visibility of hands or perspective. In sum, the effectiveness of dynamic visualizations depends on an interplay between visibility of hands and depicted perspective: Observing hands is only beneficial in the egocentric perspective, whereas the allocentric perspective might have some advantages when no hands are shown.

Session X 15

27 August 2021 12:00 - 13:00

Session Room 8

Single Paper

Higher Education, Motivational, Social and Affective Processes

Motivation and Quantitative Methods

Keywords: Educational Psychology, Higher Education, Motivation, Motivation and Emotion, Quantitative Methods, Social Interaction

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion

Chairperson: Vibeke Ankersborg, Copenhagen Business School, Denmark

Exploring the Dynamics of Situated Expectancy-Value Theory: A Repeated Measures Network Analysis

Keywords: Educational Psychology, Motivation, Motivation and Emotion, Quantitative Methods

Presenting Author:Patrick Beymer, University of Wisconsin - Madison, United States; **Co-Author:**Daria Katharina Benden, TU Dortmund University, Germany; **Co-Author:**Maien Sachisthal, University of Amsterdam, Netherlands

Situated expectancy-value theory (SEVT) suggests that students' competence beliefs and task values are proximal psychological processes that function over short periods of time. In the present study, we explored the dynamic nature of these constructs in five sections of an introductory calculus course ($n = 429$).

Using repeated measures data (11 time points within a semester), we conducted network analysis to examine how different facets of the SEVT framework are related between persons, within situations and across time. Differences emerged between all three networks. The between-person network suggested positive relations between competence, interest, and importance and between four components of cost. The within-person contemporaneous network suggested that competence beliefs, interest, and importance tend to fluctuate together; whereas the cost components fluctuate together. The within-person temporal network suggested most constructs tend to decrease throughout the semester. Results provide an important exploration of SEVT constructs, suggesting a need to consider how constructs function simultaneously both between- and within-person. Results and implications are discussed.

Social integration and development of intrinsic motivation: A latent transition analysis

Keywords: Higher Education, Motivation, Quantitative Methods, Social Interaction

Presenting Author:Marion Reindl, University of Salzburg, Austria; **Co-Author:**Tanja Auer, University of Salzburg, Austria; **Co-Author:**Burkhard Gniewosz, University of Salzburg, Austria

The present study, based on self-determination theory, investigates the link between university students' social peer and teacher integration and intrinsic motivation development. Both integration contexts are expected to contribute to the student's development, either additively or compensatory. The analyses rely on a nationally representative sample of 7619 German university students (NEPS data set) and cover the time span between 3rd and 5th semesters in a longitudinal design. Person-centered analytical tools were applied to tap interindividual differences in the motivation trajectories as well as in integration profiles. Latent transition analyses revealed distinct links between the motivational trajectories (Increase [$n = 532$], Moderate Decrease [$n = 2580$], Decrease [$n = 4507$]) and the integration profiles (Highly Integrated [$n = 2492$], Moderately Integrated [$n = 3832$], Isolated [$n = 1144$], Peer Deprived [$n = 151$]), pointing to additive effects of teacher and peer integration. Positive trajectories were more likely in the Highly than in Moderately Integrated profiles. The two profiles pointing to below average integration levels (Isolated and Peer Deprived) showed the same probabilities for rather negative trajectories. The results are discussed against the backdrop of self-determination theory and additive vs. compensatory effects of teacher and peer integration, proposing a threshold model.

Motivational mindset of first-year university students determines purpose and study engagement

Keywords: Educational Psychology, Higher Education, Motivation, Quantitative Methods

Presenting Author:Job Hudig, Erasmus University Rotterdam, Netherlands; **Co-Author:**Ad Scheepers, Rotterdam School of Management, Erasmus University, Netherlands; **Co-Author:**Michaéla Schippers, Rotterdam School of Management, Erasmus University, Netherlands; **Co-Author:**Guus Smeets, Erasmus University Rotterdam, Netherlands

First-year university students have multiple motives for studying and these motives may interact. Yet, past research has primarily focused on a variable-centered, dimensional approach missing out on the possibility to study the joint effect of multiple motives that students may have. Examining the interplay

between motives is key to (a) better explain student differences in study success and wellbeing, and (b) to understand different effects that interventions can have in terms of wellbeing and study success. We therefore applied a student-centered, multidimensional approach in which we explored motivational profiles of first-year university students by combining three dimensions of motives for studying (self-transcendent, self-oriented, and extrinsic) which have been shown to be differently related to academic functioning. Using cluster analysis in two first-year university student cohorts ($n = 763$ and $n = 815$), we identified four meaningful profiles and coined them motivational mindsets. Following this investigation, we included two important student features for wellbeing and academic performance: purpose in life and study engagement. Results showed for the first time in a university context that having a sense of purpose in life is relevant for study engagement. Moreover, results revealed that sense of purpose and study engagement differed across motivational mindsets. The findings substantiate the potential usefulness of the motivational mindset framework to explain differences between students in study success and wellbeing. The implications of the results are further discussed as well as promising avenues for future research.

Session X 16

27 August 2021 12:00 - 13:00

Session Room 1

Single Paper

Cognitive Science, Learning and Instructional Technology

Achievement, Emotion and Affect

Keywords: Achievement, Cognitive Skills, E-Learning/Online Learning, Educational Psychology, Emotion and Affect, Motivation and Emotion, Secondary Education

Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Marjon Fokkens-Bruinsma, University of Groningen, Netherlands

Green not Grey: Exposure to Nature as a Resource for Students' Cognition and Emotional Well-Being

Keywords: Achievement, Cognitive Skills, Educational Psychology, Emotion and Affect

Presenting Author: Angelica Ronconi, University of Padova, Italy; **Co-Author:** Lucia Mason, University of Padova, Italy

This theoretical paper deals with a recent growing interest in the outdoor environments surrounding schools where students spend time during recess, in-school activities, and after-school programs. The impact of exposure to nature nearby schools has become the focus of empirical studies aimed at documenting the cognitive and emotional effects that such exposure has on students' academic performance and well-being. Exposures to nature can be short-term and long-term. Short-term exposures refer to a single contact with a green environment that usually lasts for a few tens of minutes to around one and half hours. They are typical green breaks during a school day when students, for example, stay in the school garden. Long-term exposures are repeated contacts with greenness, for example when regular classes are held in outdoor learning settings. Systematic reviews have provided accumulated evidence that both types of exposure to nature are beneficial not only for students' cognitive and academic performance, but also for their emotional well-being. Two theories explain these benefits: (a) the attention restoration theory and (b) the stress reduction theory. Starting from the two theories, this contribution is intended to illustrate scientifically founded evidence of no-cost benefits of contacts with natural environments on cognition and affect in students of different educational levels, from primary to secondary school.

Student Adaptability, Emotions, and Achievement: Navigating New Academic Terrains in a Pandemic

Keywords: Achievement, E-Learning/Online Learning, Emotion and Affect, Motivation and Emotion

Presenting Author: Martin Daumiller, University of Augsburg, Germany; **Co-Author:** Kristina Loderer, University of Augsburg, Germany; **Co-Author:** Raven Rinias, Augsburg University, Germany

The COVID-19 pandemic has drastically changed the higher education landscape. In spring 2020, students were forced to abruptly switch from traditional and familiar, to new and largely improvised distance learning formats. Initial evidence suggests that students handled these unprecedented academic changes differentially well, which can have important consequences for their emotional experiences and learning outcomes. This study examined whether individual differences in students' capacity to adjust to situational uncertainty and novelty (i.e., adaptability; Martin et al., 2013) can help explain differences in their achievement-related emotional experiences (enjoyment, hope, anxiety, hopelessness) in a digital university course, and learning outcomes within that course. Eighty-eight university students rated their trait-level adaptability at the beginning of the 2020 spring semester (T1), as well as their mid-semester (T2) course-related achievement emotions. Additionally, we included their knowledge test scores as well as perceived learning gains at the end of the semester (T3). Mediation analysis indicated that adaptability was positively related to hope, and negatively to anxiety and hopelessness (controlled for prior experience with digital courseware). Hope was also positively related to students' test scores and perceived learning at T3, but no indirect effects of adaptability on learning outcomes via hope emerged. While enjoyment was also positively related to students' learning, anxiety and hopelessness were unrelated thereto. Our findings contribute to understanding individual differences in students' responses to changing academic environments, and potential consequences thereof for their emotional well-being and learning. We will discuss implications for research and supporting students in navigating novel and uncertain academic situations.

Physical fitness and psychosocial health, cognitive and academic outcomes in healthy adolescents

Keywords: Achievement, Cognitive Skills, Emotion and Affect, Secondary Education

Presenting Author: Barbara Haverkamp, University of Groningen, University Medical Center Groningen, Center for Human Movement Sciences, Netherlands; **Co-Author:** Jaap Oosterlaan, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:** Esther Hartman, University Medical Center Groningen / University of Groningen, Netherlands

Introduction: Adolescence is characterized by dramatic changes in body and behavior, and it represents a crucial stage in the maturation of cognitive functions. Higher levels of physical activity can enhance psychosocial health and are suggested to associate with better cognitive functions and academic achievement in adolescents. Physical fitness is a stable way to express varying levels of physical activity. The aim of the current study is to study the relationship between physical fitness and psychosocial health, cognitive outcomes and academic achievement in adolescents. Method: Four-hundred-and-fifty adolescents from 24 classes from 7 high schools of the Netherlands participated. All measures were assessed during school hours by trained examiners. Multilevel regression analyses were performed in MLwin to examine relations of interest adjusting for sex and age. Results: Preliminary results show that cardiorespiratory fitness is significantly related to psychosocial health: self-concept ($\beta=0.215$; $p< 0.001$), symptoms of depression ($\beta=-0.227$; $p=0.009$) and anxiety ($\beta=-0.219$; $p=0.004$). Speed-agility was significantly related to cognitive outcomes: visual working memory ($\beta=0.159$; $p=0.014$), information processing and control ($\beta=0.238$; $p< 0.001$) and interference control ($\beta=0.156$; $p=0.039$). Finally, body-composition (BMI) was significantly related to psychosocial health: self-concept ($\beta=-0.079$; $p=0.014$) and symptoms of depression ($\beta=0.119$; $p=0.024$). All other relationships were not significant. Conclusion: The results suggest that cardiorespiratory fitness and body-composition might be a protective factor against psychiatric symptoms in adolescents and that speed-agility might be effective to improve some cognitive functions in adolescents. Future research should investigate whether physical activity interventions aimed at improving physical fitness, also improve psychosocial health and cognitive functions in adolescents.

Session X 17

27 August 2021 12:00 - 13:00

Session Room 15

Invited Symposium

Learning and Special Education

SIG 15: Validity and reliability evidence of measures used to screen learning difficulties in maths

Keywords: Assessment Methods and Tools, Learning and Developmental Difficulties, Numeracy, Psychometrics

Interest group: SIG 15 - Special Educational Needs

Chairperson: Pirjo Aunio, University of Helsinki, Finland

Discussant: Annemie Desoete, Belgium

In EARLI "Learning and Special Education" -domain understanding and identifying learning difficulties is fundamental task. It is essential that the measures we use are valid and reliable. It is important to evaluate the measurements and make their psychometric evidence visible. In the field of special education it has not been a strong tradition to demand evidence of validity and reliability of measures used. In fact, in our field the knowledge is less developed compared to educational psychology for instance, although it would be highly needed. Measurement validity is related to how we define learning difficulties and how we are able to measure it. In educational practice, this forms a base for the decision making process. The aim of this symposium is to develop evidence to develop valid and reliable measurements for identifying children with mathematical learning difficulties. Around 15–25 % of children have difficulties with mathematical development. It is crucial to be able detect children who are at risk for developing mathematical difficulties at an early age and provide support needed. The papers report validity and reliability of measurements by using systematic review methods and empirical data from three countries. To secure interaction during symposium we use chat, online discussion and other means so audience can answer some questions live online and provide feedback. Validity and reliability are important concepts in terms of research but are applied differently. An open debate about these issues and the importance of them will raise scientific rigor of the research in the field.

Validity and reliability evidence of numeracy measures used in elementary school

Presenting Author:Airi Hakkarainen, University of Helsinki, Finland; **Co-Author:**Annukka Relander, The University of Helsinki, Finland; **Co-Author:**Pirjo Aunio, University of Helsinki, Finland; **Co-Author:**Anu Laine, University of Helsinki, Finland

Good psychometric properties of numeracy measurements are important in identifying students at risk for mathematical learning difficulties. The aim of this systematic review was to evaluate the validity and reliability evidence of numeracy measures intended for teachers to use at the elementary school. Method: A systematic search of Cinahl, Embase, ERIC, PsychINFO and PubMed abstract databases was performed in March 2020. The terminology and classification of psychometric properties followed the COensus-based Standards for the selection of health Measurement INstruments (COSMIN) guidelines for systematic reviews of patient-report outcome measures. COSMIN Bias of checklist includes 10 psychometric properties to be evaluated, of which one, responsiveness, was beyond the scope of this systematic review. Instruments for children aged 9–12 years and published in English after 1st of January 2000 were included in this review. Results: Fifteen studies reported on selected psychometric properties of 13 identified instruments. The results showed that reporting psychometric properties following the COSMIN guidelines was quite limited. In reporting the validity of a measure, the hypothesis testing was the most often reported property. Instead, content validity, the most important property of the measure (Mokkink et al., 2018), was the least reported property. In reporting reliability of a measure, the internal consistency was most often reported property and the test-retest reliability was the rarest. It is crucial that further research on psychometric properties of numeracy measures will be conducted. Especially, content validity needs to be reported in the development phase of measure.

Validity of an online dyscalculia screener for grades 3 to 9

Presenting Author:Johan Korhonen, Åbo Akademi University, Finland; **Co-Author:**Pekka Räsänen, University of Turku, Finland; **Co-Author:**Pirjo Aunio, University of Helsinki, Finland; **Co-Author:**Anu Laine, University of Helsinki, Finland; **Co-Author:**Airi Hakkarainen, University of Helsinki, Finland; **Co-Author:**Eija Väistö, University of Helsinki, Finland; **Co-Author:**Jonatan Finell, Åbo Akademi University, Finland; **Co-Author:**Teemu Rajala, University of Turku, Finland; **Co-Author:**Mikko-Jussi Laakso, University of Turku, Finland

Research has shown that weak basic numerical skills is a core deficit in mathematical learning difficulties in both younger and older students. Interestingly, the results are less clear concerning basic numerical skills and possible gender differences. The aim of this study was to validate an online dyscalculia screener and analyze the effects of gender on basic numerical skills from grades 3 to 9. A sample of 4265 students completed a test battery consisting of Number comparison, Digit dot matching, Number series, Single-digit addition, Single-digit subtraction and Multi-digit calculations. Confirmatory factor analyses supported a two-factor model of basic numerical skills (number processing and arithmetic skills) and the screener displayed measurement invariance across gender, language group and grade level. Both number processing and arithmetic skills were positively related to grade level. Boys had higher arithmetic skills while the gender difference in favor of girls increased by grade level regarding number processing. This study showed that the FUNA-DB displayed reliability and validity evidence across grades 3 to 9 and that gender was differentially related to number processing and arithmetic skills.

The SYmbolic Magnitude Processing Test (SYMP-Test). A validation in Belgium and Finland

Presenting Author:Bert De Smedt, KU Leuven, Belgium; **Co-Author:**Johan Korhonen, Åbo Akademi University, Finland; **Co-Author:**Pirjo Aunio, University of Helsinki, Finland

Around 15–25 % of children and adults experience difficulties with mathematical development and these mathematical difficulties might have far-reaching consequences for the future school career of children. It is therefore crucial to detect and support children who are at risk for developing mathematical difficulties at an early age. Against the background of studies that show that the ability to process symbolic magnitudes is a critical predictor of mathematical performance, we developed the SYmbolic Magnitude Processing Test (SYMP-Test). This test aims to evaluate children's symbolic magnitude processing skills in a quick and classroom-friendly manner. The present contribution includes two studies that examined the convergent and discriminant validity of the SYMP-Test in a sample of primary school children (Study 1, n = 1588, age range 6–14-year-olds) and preschool children (Study 2, n = 363, age range 3–6-year-olds) in Belgium and Finland, respectively. Both studies revealed that the SYMP Test showed reliable associations with standardized measures of mathematics achievement and that these associations were significantly stronger than associations with standardized measures of non-mathematical cognitive ability/achievement. This all shows that the SYMP Test had convergent and discriminant validity and that it can be used as a screening tool to detect individual differences in mathematics achievement. Study 2 clearly reveals that this can be done already in preschool. Future longitudinal work is needed to establish predictive validity and to examine whether the SYMP Test can predict future difficulties in mathematics learning.

Number Estimation Line tasks: The impact of instructional variations

Presenting Author:Jo Van Herwegen, UCL Institute of Education, United Kingdom; **Co-Author:**Laura Outhwaite, UCL- Institute of Education, United Kingdom; **Co-Author:**Victoria Simms, Ulster University, United Kingdom

The current study examined the impact of different instructions on number estimations tasks in preschoolers (n= 110) using a between-subject design. Preschoolers (n=110) were either given the normal instructions (Normal), an instruction that included the experimenter to hover across different parts of the number line (Hovering) and an instruction in which a less knowledgeable puppet (Puppet) showed the child where to put the number 5 for 0-10 line or 10 for 0-20 line. Results showed that, although there were no overall significant differences in error rates between the different conditions, more detailed investigation of the error rates for each line showed that children had smaller percent absolute errors (PAEs) for the 0-20 number line in the Hovering condition and smaller PAEs for the 0-10 line in the Puppet condition. The impact of these results show that it is necessary to assess the validity of the task, including how children understand the instructions.

Session Y 1

27 August 2021 14:30 - 15:30

Session Room 13

Single Paper

Educational Policy and Systems, Teaching and Teacher Education

Learning and Professional Development

Keywords: Competencies, Content Analysis, Educational Policy, Lifelong Learning, Qualitative Methods, Vocational Education

Interest group: SIG 14 - Learning and Professional Development
Chairperson: Huib Tabbers, Erasmus University Rotterdam, Netherlands

Measuring Creativity in Business, Medicine, Information and Technical Professions

Keywords: Competencies, Content Analysis, Qualitative Methods, Vocational Education

Presenting Author:Silke Fischer, Eidgenössische Hochschule für Berufsbildung (SFIVET), Switzerland; **Co-Author:**Antje Barabasch, EHB, Switzerland

Creativity is a critical success factor for a wide range of professional activities. It is therefore considered one of the four core competencies of the 21st century, which already should be promoted in vocational education and training (VET). The acquisition of creativity is one of the major challenges for the didactics of modern VET. In order to comprehensively promote creativity didactically, it is important to understand what creativity means or entails in the context of different professions. This interview study examined the facets of creativity in four professions. The results show that for performing professional activities in the professions of commercial clerks, specialists in care, design engineers and IT specialists, different facets of creativity are important. In almost all professions, divergent and convergent thinking are of great importance.

Key competences: Citizens' perspectives

Keywords: Competencies, Content Analysis, Educational Policy, Lifelong Learning

Presenting Author:Joonas Mannonen, Finnish Institute for Educational Research, University of Jyväskylä, Finland; **Co-Author:**Raija Hämäläinen, University of Jyväskylä, Finland; **Co-Author:**Joni Lämsä, University of Jyväskylä, Finland; **Co-Author:**Bram De Wever, Ghent University, Belgium

Over the past several decades, the competences that education systems produce have emerged as a prevalent topic in European educational policy discourse. In addition to many national and supranational frameworks for and assessments of key competences, there is a need to understand the perspectives of citizens. This study focuses on the key competences whose enhancement by the education system citizens from a diverse set of backgrounds in Finland considered essential. In all, 70 citizens were interviewed around the country. A holistic typology of competence was used as the basis for content analysis. The results illustrate 19 key competences as described by the citizens. In particular, the citizens emphasised the importance of social and meta-competences. In our presentation, we discuss the congruency of our findings with supranational key competence frameworks.

Session Y 2

27 August 2021 14:30 - 15:30

Session Room 17

Single Paper

Educational Policy and Systems, Teaching and Teacher Education

Educational Policy and Content Analysis

Keywords: Content Analysis, Educational Policy, Environmental Education, History, Qualitative Methods, Secondary Data Analysis, Teacher Professional Development

Interest group: SIG 11 - Teaching and Teacher Education, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Marc Sarazin, University of Edinburgh, United Kingdom

Actor-structure dynamics, digital learning, and homeschooling during the corona pandemic

Keywords: Content Analysis, Educational Policy, Qualitative Methods, Secondary Data Analysis

Presenting Author:Christian Herzog, Leuphana University Lueneburg, Germany; **Co-Author:**Alessandro Immanuel Beil, Leuphana University Lueneburg, Germany

Taking as a starting point the challenges that the corona pandemic has caused for the German education system, this paper investigates how the power balance between schools, families and politics has been affected. Using Schimank's (2010) actor-structure dynamics approach we analyzed German press coverage during two three-month periods by means of Braun and Clarke's (2006) thematic analysis method. In order to portray the self-perception of each actor and to show how each actor is perceived by the others we crafted six themes from the data. We find, first, that there is increasing mutual understanding by schools and families for the situation and actions of the other. Second, both schools and families perceive actors from the politics nexus as lacking a future-oriented uniform strategy. We discuss these findings in light of the theoretical underpinning of the study and scrutinize the applicability of Schimank's approach for other issues of educational governance, learning and instruction.

ICT-related Teacher Professional Development in Germany before COVID-19: Where do we go from here?

Keywords: Content Analysis, Educational Policy, Qualitative Methods, Teacher Professional Development

Presenting Author:Lara-Idil Engec, University of Duisburg-Essen, Germany; **Co-Author:**Manuela Endberg, University of Duisburg-Essen, Germany

The study "ForUSE-digi – Teacher professional development (TPD) and school support systems for school development regarding digitalisation in education" aims at filling up the lack of a systematic and nation-wide inventory of TPD and other support offers in the context of digitalisation in Germany. The suggested presentation displays findings from the study with the focus on ICT-related TPD-measures from all German federal states. Integrating ICT into schools is a central challenge in today's educational system. All countries share the current and future challenge: preparing students for a life in a digital world, and, consequently, enabling teachers and supporting schools to meet this challenge. On a theoretical level, different frameworks describing knowledge and competences needed for using ICT in teaching and learning (e.g. Koehler & Mishra, 2009) exist and a great body of empirical findings on what makes TPD effective (e.g. Lipowsky, 2019) is on hand. All German federal states committed themselves to support their respective school system to foster students' "competences in the digital world" (KMK); so, they offer varying support regarding the overarching theme of digitalisation. Nevertheless, a systematic nation-wide overview on ICT-related TPD does not yet exist. Thus, the main aim of ForUSE-digi is to provide a systematic inventory of support systems in all federal states. For this contribution, 450 TPD announcement texts are analysed using content analysis (other support measures are covered in the overall study). Considering established beneficial conditions of what makes TPD effective, the offers from all federal states are checked for effectiveness.

The Times They Are a-Changin` (Bob Dylan): Migrants in school system - something old or new?

Keywords: Content Analysis, Educational Policy, Environmental Education, History

Presenting Author:Gülay Teke, University of Potsdam, Germany; **Co-Author:**Michel Krieg, Humboldt-University Berlin, Germany

In Berlin there are 520 (2020) established school classes for children with no knowledge of German. These are called "welcome classes". The admission of pupil who are migrants is not new to the education system. Therefore, the question is how the organization school, after more than 50 years of experience with immigration, enables newly immigrated children and young people to gain access to education in the school system. Schools have the official freedom to decide how to deal with new immigrants. It is recommended to "set up learning groups" for new pupil. It is planned that the students in the welcome classes learn the German language and at the latest after 12 months go on to the regular classes. This paper gives an overview of the first research results on the design of the transitional movement from a welcome class to a regular class. Guideline-based expert interviews were conducted to address this issue. 400 Berlin schools were enquired. 16 of these schools agreed to participate in the survey, including eight primary schools, three high schools and five secondary schools. For the study, a total of 53 interviews were conducted with school principals, welcome class teachers and regular class teachers. These focus qualitatively on the viewpoint of the decision-makers. The interviews are evaluated with the qualitative content analysis and a smaller sample with the documentary method. The focus of the study is on access to action-guiding knowledge of the actors. This action guiding knowledge opens the access to action practice.

Session Y 3

27 August 2021 14:30 - 15:30

Session Room 2

Single Paper

Instructional Design, Learning and Instructional Technology

Instructional Design and Learning Technologies

Keywords: Educational Technology, Instructional Design, Learning Analytics, Learning Technologies, Multimedia Learning, Student Learning

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 06 - Instructional Design, SIG 27 - Online Measures of Learning Processes

Chairperson: Sara Hennessy, University of Cambridge, United Kingdom

What COVID-19 distance-education transitions reveals about learning and teaching practices ?

Keywords: Educational Technology, Instructional Design, Learning Technologies, Student Learning

Presenting Author:Bernadette Charlier, University of Fribourg, Switzerland; **Co-Author:**Joris Felder, Haute école pédagogique de Fribourg, Switzerland; **Co-Author:**Laura Molteni, University of Fribourg, Switzerland; **Co-Author:**Katharina Baran, University of Fribourg, Switzerland

The study of transitions from one learning environment to another reveals how learners construct and transform their learning practices according to their technological, cognitive, epistemic and social dimensions. In this communication, the results of an exploratory research analysing the learning practices' transformations lived by learners at each level of education, from primary to university, during the situation of forced transition to distance education in the Canton of Fribourg in Switzerland are presented. The method MEPA (Author1, 2019) of modelling student's Personal Learning Environments (PLE makes it possible to describe learning practices transformations and to link them with transformations in the learning design of the teaching environment as described by their teachers for the upper secondary and higher education levels. Beyond the diversity of learning practices, research results highlight how a rapid transition from one learning environment to another may be, according to students personal characteristics, either a risk conducting to the impoverishment of learning practices or an opportunity to develop self-regulated learning. In between these two trends, the research highlighted two other types of intermediate transformations. In conclusion, this research's contributions in terms of methodology, making visible and understanding learning practices 'transformations and perspectives to support the management of transitions in learning environments will be presented. It will lead to suggestions to manage the teaching and learning environment in such an uncertain future.

Temporal contiguity in learning biological ecosystem in Virtual Reality and individual differences

Keywords: Educational Technology, Instructional Design, Learning Technologies, Multimedia Learning

Presenting Author:Porte Laurie, Lead - CNRS / Université de Bourgogne, France; **Co-Author:**Jean-Michel Boucheix, University of Dijon, LEAD-CNRS, France

Abstract. This paper is a part of a project, which aims to design a forest simulator in virtual reality (VR). The goal of the present experiment was to test a multimedia, "principle" in order to apply it in an immersive live forest simulator. To investigate the influence of (de)-synchronization between narrated text and dynamic pictures in VR, we used a multimedia lesson about organic matter decomposition. The lesson was presented in the form of a non-immersive VR video. After a first pilot study with a group of 12-year-old pupils, the effect of five temporal contiguity conditions was tested on recall and comprehension, involving 227 junior high school participants, the delays between the narration and the animation were respectively: -6, -2, 0, +2, +6 seconds. Result showed a significant effect of temporal gaps in 12 years' children, thus extending previous research. Even a -2 sec. delay was detrimental to learning, mediated by working memory; there was an asymmetry between negative and positive delays. Further, despite a strong mechanism of text and pictures cognitive integration, the pupils were aware of the temporal gaps manipulations. The effect of temporal contiguity was moderated by individual differences in verbal working memory span and spatial abilities.

Effects of Teachers Acting Naturally vs. Didactically During Video Learning

Keywords: Educational Technology, Instructional Design, Learning Analytics, Learning Technologies

Presenting Author:Selina Nadine Emhardt, Open Universiteit Nederland, Faculty of Educational Sciences, Netherlands; **Co-Author:**Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands; **Co-Author:**Saskia Brand-Gruwel, Open University of the Netherlands, Netherlands; **Co-Author:**Christian Drumm, FH Aachen University of Applied Sciences, Germany; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

Instructional videos, in which a teacher (or 'model') demonstrates how to perform a task, are often called video modeling examples (VME). These videos have recently become a popular tool for online education. However, the behavior of the models varies substantially across videos with unknown effects on learning. Our study investigated the effects of displaying a model's natural or more didactic problem-solving behavior in a VME. We defined natural behavior as the model's regular approach to solve a (code debugging) problem. In contrast, we defined behavior as didactic when the model aimed to explain how to solve the task in an understandable manner to a novice audience. We performed this study with 'Eye Movement Modeling Examples' (EMME), which are VMEs that display the location of the model's eye movements during task performance, for instance as a moving dot. Participants watched EMME that either showed a programming teacher's natural or didactic code debugging behavior. Unexpectedly, the displayed model behavior did not affect learners' perceived mental effort and post-test performance. We conclude that the effectiveness of learning from videos (here EMME) is not disturbed by the model's type of behavior; provided that the model is an experienced teacher. Future research should extend this research to other video types and models with less teaching experience. Finally, studies should investigate effects of different video characteristics on learning to create evidence-based guidelines to create instructional (EMME) videos.

Session Y 4

27 August 2021 14:30 - 15:30

Session Room 14

Single Paper

Higher Education, Motivational, Social and Affective Processes

At-risk Students

Keywords: At-risk Students, Higher Education, Peer Interaction, Primary Education, Quantitative Methods, School Effectiveness, Survey Research

Interest group: SIG 04 - Higher Education, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Yi-Jhen Wu, Institute for School Development Research (IFS), TU Dortmund, Germany

Determining Fit: The Role of Matching Procedures in Higher Education Students' Enrollment Behavior

Keywords: At-risk Students, Higher Education, Quantitative Methods, School Effectiveness

Presenting Author:Karlijn Soppe, Utrecht University, Netherlands; **Co-Author:**Irene Klugkist, Utrecht University, Netherlands; **Co-Author:**Theo Wubbels, Utrecht University, Netherlands; **Co-Author:**Leoniek Wijngaards-de Meij, University Utrecht, Netherlands

Recent European research indicated the need to improve the process of program choice of prospective students. Improving this process should foster the person-environment fit and as a result decrease dropout. In the Netherlands, attempts to improve such fit between students and university programs were made through the implementation of matching procedures, a final check on prospective students' initial program choice. We argue that prospective students who lack feelings of fit during these matching procedures are less likely to finalize their enrollment. A wide array of matching procedures exists that differ in intensity and the aspects of fit that can be tested. Using data of thirteen study programs at four Dutch universities, the association between different types of matching procedures and finalizing enrollment or not was examined. The data shows that the more aspects of person-environment fit a student can test during a matching procedure, the less likely the student is to finalize enrollment. That these lower enrollment rates in programs with more intensive matching procedures are a result of the implementation of matching procedures, seems probable given the differences in enrollment behavior between pre-matching cohorts and matching cohorts. Higher education institutions wishing to achieve lower enrollment rates and a better fitting student population should focus on designing fit checks in such a way that multiple aspects of person-environment fit can be tested.

The long-haul of COVID: Fall 2020 challenges for students, families, & staff in high-poverty schools

Keywords: At-risk Students, Primary Education, School Effectiveness, Survey Research

Presenting Author:Courtney Pollack, Boston College, Massachusetts Institute of Technology, United States; **Co-Author:**Maria Theodorakakis, Boston College, United States; **Co-Author:**Yan Leigh, Boston College, United States; **Co-Author:**Mary E. Walsh, Boston College, United States; **Co-Author:**Allison Morgan, Boston College, United States

In Fall 2020, education stakeholders in high-poverty schools - students, families, teachers, and school staff - faced continued and exacerbated challenges from the ongoing pandemic. High levels of need can lead to unsystematic approaches to service delivery. Alternatively, systemic and systematic identification of stakeholders' needs and challenges is the first step to effectively meeting them. In this study, we examined the ongoing needs and challenges of education stakeholders in high-poverty schools in three U.S. states. Schools participated in an integrated student support intervention, an evidence-based, whole-child, systemic approach to identifying student strengths and needs, and providing support for all students in a school. We surveyed 73 coordinators: intervention personnel embedded in the school who work with education stakeholders to support students across academic, socio-emotional/behavioral, health, and family domains. Through Likert-scale and open-ended items, coordinators reported on families' needs in Fall 2020 and student/family and teacher/staff challenges. Results showed that most prevalent family needs related to child care, food, and technology, and that needs from Spring 2020 persisted in the fall. Challenges spanned domains for all stakeholders, and included basic necessities for families, communication among stakeholders, fear of contracting COVID-19, and stress and burn-out for teachers/staff. Results underscore the need for ongoing support and to identify areas of focus, across domains. Results further illustrate the benefit of holistic, systemic approaches to student support and will contribute to theoretical understandings of the aftereffects of prolonged natural disasters on the cognitive and emotional well-being of education stakeholders.

Resilient students in the social structure of the class

Keywords: At-risk Students, Peer Interaction, Primary Education, Quantitative Methods

Presenting Author:Dóra Fanni Szabó, MTA-SZTE Research Group on the Development of Competencies, Hungary

There has been growing interest in studying factors of success at school despite the presence of threatening socio-economic background. Research of resilience highlighted the importance of social relationships. Social interactions at the class is at the basis of various forms of social learning, such as feedback giving, knowledge sharing and help seeking. The aim of our study was to explore the sociometric characteristics of primary school classroom communities, which comprise resilient students. Data were gathered through a self-developed, paper and pencil peer nomination survey, which consist of 18 items including questions concerning sympathy, popularity and community functions. Sociometric indices of 209 students and 13 classes in grades 4–7 were analysed. Results show that in the case of more supportive classes, according to the density index the average number of ties by one person is 1,12, while in the less supportive sample the index is 0,91. Our findings reveal that the resilient students have a significantly more favorable ($p=.032$) position in the social structure of the class compared to the non-resilient students with low socio-economic status. The presentation also highlights that the class size has a crucial importance.

Session Y 5

27 August 2021 14:30 - 15:30

Session Room 9

Single Paper

Lifelong Learning

Lifelong and Workplace Learning

Keywords: Collaborative Learning, Informal Learning, Lifelong Learning, Multimedia Learning, Quantitative Methods, Survey Research, Workplace Learning

Interest group: SIG 14 - Learning and Professional Development

Chairperson: Nora Heyne, Otto-Friedrich-University Bamberg, Germany

Learning Barriers at the Workplace: Development and Validation of a measurement instrument

Keywords: Informal Learning, Lifelong Learning, Quantitative Methods, Workplace Learning

Presenting Author:Sebastian Anselmann, University of Education Schwäbisch Gmünd, Germany; **Co-Author:**Uwe Faßhauer, University of Education Schwäbisch Gmünd, Germany

While facilitating factors for learning at work are well investigated (cf. Kyndt et al., 2018), less is known about barriers occurring when approaching a learning activity (Boeren, 2016). Barriers for learning at the workplace are factors that hinder the initiation of successful learning, interrupt learning possibilities, delay the proceedings, or end the learning activities much earlier than intended (Crouse, Doyle, & Young, 2011). Existing instruments measuring learning barriers focus only on organisational level. Therefore, the aim of this presented study is the development and validation of an instrument measuring barriers for informal and formal learning at the workplace.

Based on the results of the pre-study, an interview study with 26 consultants describing their learning barriers and based on existing research (Belling, James & Ladkin, 2004; Crouse et al., 2011) we developed a measuring instrument. The measurement instrument comprises six factors with items on individual barriers, organisational/ structural barriers, technical barriers, change and uncertainty. In order to validate our scales we conducted a cross-sectional questionnaire study with 112 employees and freelancers ($N= 112$) in consulting. Validation includes Exploratory Factor Analysis, Internal Consistency Assessment, Confirmatory Factor Analysis, and Convergent Validity Assessment. Results show a three factor scale measuring barriers for formal learning and two factor scale for measuring barriers for informal learning. Further results are satisfying with for example Cronbach's alpha for all scales ranging from $\alpha=.80-.86$. We assume our developed and validated scale helps to gain insights to factors hindering individuals to learn and shows organisations their potential for change.

Continuing education through video-based interaction analysis

Keywords: Collaborative Learning, Lifelong Learning, Multimedia Learning, Workplace Learning

Presenting Author:Laurent Fillietzaz, University of Geneva, Switzerland; **Co-Author:**Stephanie Garcia, University of Geneva, Switzerland; **Co-Author:**Marianne Zogmal, University of Geneva, Switzerland

Whether engaged in initial or continuing education programs, workers today frequently experience situations in which they are required to comment, describe and analyze their activities as documented by audio-video recordings. In this contribution, we propose to explore a particular method of video analysis, focusing on verbal and non-verbal interactions in work and training situations. We present the particularities of such a method and question its potentialities in terms of learning and development. The approach we are presenting here is part of an ongoing research and training program being carried out in Switzerland in the field of early childhood education. This research program contributes to the continuing education of educators in a particular aspect of their work: relationships with parents. The objective of our research and intervention design is to assist educators to better identify the interactional competences required when encountering parents in their daily work. The research design consists in bringing in-service educators to observe, comment and analyze naturally occurring encounters with parents recorded on video as children arrive in childcare facilities in the morning and are being picked up by their parents in the end of afternoon. The research results highlight the potential of a video-based analysis approach conducted according to the principles of interaction analysis for the continuing education of early childhood educators. They show how the confrontation with video data can support learning processes in continuing education.

Low-educated adults' perceived educational needs and barriers to learning: Evidence from PIAAC

Keywords: Lifelong Learning, Quantitative Methods, Survey Research, Workplace Learning

Presenting Author:Lisse Van Nieuwenhove, Ghent University, Belgium; **Co-Author:**Bram De Wever, Ghent University, Belgium

Today, there is a clear and growing need of more frequent renewal of knowledge and competencies. The competencies needed to participate fully in society are changing. The current COVID-19 crisis only adds to the importance of being able to comprehend and analyze complex information on a daily basis. Every adult will be targeted by these societal changes but low-educated adults are especially at risk, possibly leading to increased inequality between low- and high-

educated adults. Participation in adult education could respond to the aforementioned needs. However, research shows that low-educated adults participate least in adult education. This adds to the possibility of growing inequality between low- and high-educated adults. For this reason, it is important to study what is withholding low-educated adults from participating in adult education. The present study uses PIAAC-data to study educational needs and barriers of low-, medium- and high-educated adults across 15 European countries. Descriptive results indicate that educational needs and the occurrence of barriers are lowest among low-educated adults. In detail, medium- and high-educated non-participants indicate being prevented because of work and family responsibilities, while low-educated non-participants reported family responsibilities but mainly chose the option 'other' to describe their barriers. As such, low-educated adults' most important barrier could not be defined. A possible explanation is that they experience more dispositional barriers, which were not included in the list. Follow-up research targeting low-educated adults is needed.

Session Y 6

27 August 2021 14:30 - 15:30

Session Room 7

Single Paper

Learning and Social Interaction

Secondary Education

Keywords: Bilingual Education, Content Analysis, Educational Psychology, Knowledge Creation, Language (Foreign and Second), Motivation and Emotion, Peer Interaction, Physical Sciences, Secondary Education, Social Interaction

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Javier Fernández, Universidad Autónoma de Madrid, Spain

Manifestations of non-interest

Keywords: Content Analysis, Educational Psychology, Motivation and Emotion, Secondary Education

Presenting Author: Jael Draijer, University Utrecht, Netherlands; **Co-Author:** Larike Bronkhorst, Utrecht University, Netherlands; **Co-Author:** Sanne Akkerman, Utrecht University, Netherlands

It is increasingly recognized that appealing to the interests of adolescents within education can increase school engagement and academic achievement. A variety of educational approaches, e.g. personalized and connected learning, aim to involve students' pre-existing (sustained) interests in education, in order to get adolescents more interested in curricular content. However, existing literature indicates this might not always be successful: engaging with an object of interest does not guarantee interest. The current study explores these moments of *non-interest* both in and out of school and aims to contribute to understanding interest not as a stable, but as an experiential and dynamic construct. Participants of the study were 60 adolescents aged 14-26 years (57% female) from the Netherlands. We used an experience sampling method (ESM) implemented in a smartphone application to prompt adolescents to report on events with their objects of interest, asking them what they did or did not find interesting within the moment. Results indicate five manifestations of non-interest and show how the situated potential of the object of interest in the eyes of the adolescent is key in experiencing interest: either interest is not anticipated at all, or the adolescent anticipates interest but it is not realized, e.g. because of limited engagement, an insufficient object or non-successful activity. Alternatively the potential *is* realized, but the event brings other negative byproducts and non-interest occurs anyway. These results suggest that involving adolescents' interests in school may only be successful when the situated potential of the object is accounted for.

Micro-analyses of students' productions in physics reveal misunderstandings not misconceptions

Keywords: Knowledge Creation, Physical Sciences, Secondary Education, Social Interaction

Presenting Author: Alaric Kohler, HEP BEJUNE, Switzerland; **Co-Author:** Anne-Nelly Perret-Clermont, University of Neuchâtel, Switzerland

Sommer et al. (2010) invite researchers to examine children's productions from a theoretical stand that centers on understanding the meaning of what children are doing in their context here and now, rather than on the distance between their productions and normative external references and categorizations. Such investigations have the potential to reveal psychological processes and issues, which remain otherwise invisible to researchers. To this end, the present study investigates data collected in a 12 weeks field study of 17 years old students studying Newton's laws. Analyses are carried out for specific moments, selected with a critical incidents technique, when high school students are not meeting the cognitive expectations of their physics teacher. Are these discrepancies due to misconceptions that would be putting them at odd, or to other processes involved? We will present examples of students trying to grasp new concepts or answering tests in which it is clear that they are not relying on conceptions prior to learning, but trying to reason with/on the linguistic productions, signs and images that are constitutive of the *teaching*. We will point to similarities between the difficulties encountered by the students and the misunderstandings Newton encountered in his time. We will conclude suggesting that Newtonian physics at school is a very complex object of discourse, with specific pitfalls and challenges, and that teaching may be more efficiently improved if students' mistakes are studied as *situations of misunderstanding* rather than as resulting from immature preconceptions.

Oracy skills development in the language of instruction (L2) through Dialogic Literary Gatherings

Keywords: Bilingual Education, Language (Foreign and Second), Peer Interaction, Secondary Education

Presenting Author: Maite Santiago-Garabieta, University of Deusto, Spain; **Co-Author:** Rocio Garcia-Carrion, University of Deusto, Spain; **Co-Author:** Aitana Fernandez-Villardon, University of Deusto, Spain

The development of oracy skills in the language of instruction is a key factor in access to learning and the development of active citizens. Especially for students studying in their second language (L2), it is particularly relevant as the school brings their only opportunity to do it. Despite its relevance, specific teaching and learning of oracy skills is not a common practice in the classrooms. At present, monological discourse still prevails in educational settings, thus reducing the opportunities for production in the language of instruction and the development of productive interactions. Previous research on dialogical learning environments has shown their value in increasing the quality of classroom interactions. Therefore, educational actions such as the Dialogic Literary Gatherings (DLG), based on the dialogical conception of learning, could contribute to turning this trend around, offering opportunities for interaction and deepening the development of oracy skills. Based on a mixed methodological design, this paper analyses the impact of DLGs on the development of oracy skills in the language of instruction of secondary school students. The results show the effectiveness of DLGs for the development of oracy skills in the school language and students L2, especially in terms of cognitive and socio-emotional skills.

Session Y 7

27 August 2021 14:30 - 15:30

Session Room 16

Single Paper

Higher Education

Qualitative Methods and Higher Education

Keywords: Culture, Higher Education, Knowledge Creation, Qualitative Methods, Researcher Education, Social Sciences, Student Learning, Writing/Literacy

Interest group: SIG 04 - Higher Education, SIG 24 - Researcher Education and Careers

Chairperson: Sergio Grossi, University of Padova, Italy, Italy

Students' perception of critical thinking as related to the undergraduate thesis

Keywords: Higher Education, Qualitative Methods, Social Sciences, Student Learning

Presenting Author: Maria Öhrstedt, Stockholm University, Sweden

Higher education should foster a palette of skills, of which critical thinking is one. Referred to as civic basic knowledge, there is broad consensus on the benefits of critical thinking skills in general. Still, it is difficult to pinpoint the characteristics of critical thinking in various educational contexts, as different disciplines and specific assignments. A deeper understanding of how critical thinking is perceived and expressed in diverse educational settings is required to fulfil our ambitions to scaffold students' acquisition of this skill. This study examines critical thinking from a student perspective, and takes its starting point in the undergraduate thesis. Semi-structured-interviews with 18 students, who had just completed their undergraduate theses in psychology, were conducted. The participants were prompted to reflect on critical thinking as related to their undergraduate thesis project. In particular, students referred to the capacity to judge quality in psychological research: others' as well as their own. A thematic analysis of the narratives resulted in one main theme: professional agency, with three subcategories: 1) autonomy, 2) justified arguments, and 3) scientific understanding. The psychology students' understanding is discussed and related to more general descriptions of critical thinking from an educational perspective. Pedagogical implications are elaborated.

Competing meanings of international experiences for researchers: Collaborative autoethnography

Keywords: Culture, Higher Education, Qualitative Methods, Researcher Education

Presenting Author:Yusuke Sakurai, Ochanomizu University, Japan

Although there is a pressing demand of international experience on early career researchers, the meaning of the experience in researchers' work responsibilities is still unclear. Five Japanese early-career researchers with PhD in education collaboratively worked together for this autoethnographic study, using our emic reflections to explore the meaning of our capital—past international study experiences—amid our current work responsibilities. Our discussion also unpacked how we made sense of our experiences in our unique Japanese university work settings. This study draws on Identity Trajectory as a theoretical framework to understand researcher development and sense-making in the continuum of one's past, present, and future. Our conversation reached our agreement on the five major, but competing themes of our international experiences (1) global personal network, (2) communicative competence, (3) community culture, (4) scholarly ambition, and (5) pedagogical application. We realised that we consistently valued the global capital but simultaneously recognised dilemmas while engaging in our responsibilities at our universities. Lack of institutional support was critical for us to use our capital of international experiences and further develop as researchers. This study offers insights for those who consider an academic career in Japan returning back from international sojourns as well as university policy-making for promoting the internationalisation and competitiveness of Japanese higher education. Our autoethnographic study closely depended on the context. Therefore, in response to worldwide encouragement of researchers' mobility, more studies would contribute to the broad understanding of the value of international experience.

Supervision and academic literacies

Keywords: Higher Education, Knowledge Creation, Qualitative Methods, Writing/Literacy

Presenting Author:Karl-Heinz Pogner, Copenhagen Business School, Denmark; **Presenting Author:**Vibeke Ankersborg, Copenhagen Business School, Denmark

Our contribution explores the concept of 'vejledning' in the context of Danish Higher Education in order to investigate how student-centered supervision, can foster Master's thesis students' research literacies. Supervision, deeply embedded in the tradition of problem-oriented project work, encourages students to find their own way ('vej'). We unfold the relationship between supervisor and student/s in order to show how it enables and constraints students in acquiring research literacies. Our analytical framework links pedagogical models of supervision (supervision models) with types of approaching supervision (supervisor roles). We combine models and roles in order to investigate which influence the flexibility to change roles has on the students' chances to acquire research literacies and to fulfill the expectations of the students concerning their Master's thesis (research) process and their Master's thesis text. The empirical data consist of eleven semi-structured research interviews with 13 master's thesis students at a Danish business university, conducted during or shortly after their thesis writing process. Our analysis is based on philosophical hermeneutics (Gadamer²2004) using an abductive approach. Our findings show that the partnership supervision model assigns most responsibility and autonomy to the student/s. The supervisor can enhance the students' research literacy by qualifying the students to make well-informed decisions concerning their knowledge production and text production. Furthermore, it can offer independence and autonomy and empower the students to decide independently whether and when to conform, transform or resist, which is in line with the expectations of autonomy of Master's thesis text and process.

Session Y 8

27 August 2021 14:30 - 15:30

Session Room 10

Single Paper

Assessment and Evaluation, Learning and Social Interaction

Cognitive Development and Skills

Keywords: Cognitive Development, Cognitive Skills, Culture, Early Childhood Education, Self-regulation

Interest group: SIG 16 - Metacognition

Chairperson: Rianne van Lambalgen, Utrecht University, Netherlands

Self-Regulated Learning in Turkish Preschool Context

Keywords: Cognitive Development, Cognitive Skills, Early Childhood Education, Self-regulation

Presenting Author:Seda Sarac, Bahcesehir University, Turkey; **Co-Author:**Sema KARAKELLE, Istanbul Üniversitesi, Turkey

The aim of this study is to investigate the psychometric properties of the Children's Independent Learning Development Checklist (CHILD 3-5), (Whitebread et al. 2009) in the Turkish context and discuss the results in conjunction with the international data from the Whitebread et al. (2011) study. CHILD 3-5 is a 22-item rating scale where each child is assessed on a 4-point likert scale. A series of factor analyses conducted with data sets from UK, Germany and Israel samples showed that the scale had a two-factor structure in these samples, namely; self-regulation and social regulation. For the current study, we gathered data from three different samples to investigate the psychometric structure of the scale. In the first phase (n=252), item statistics and factor structure of the 22-item scale were explored and due to psychometric problems, 6 items were removed from further analysis. Factor analysis with the remaining 16 items yielded a single factor solution. Analysis with the second (n=197) and third (n=453) data sets, again, showed that the scale has a single factor structure. Results showed that the CHILD 3-5 scale is a reliable and valid tool to be used in the Turkish context; however, data from the Turkish sample did not support the two-factor solution from the international samples (UK, Germany and Israel). It seems that there are cultural differences in teachers' perceptions of what types of behaviours are indicators of self-regulation in young children.

The Relationship between Executive Functioning and Self-Regulated Learning in Australian Children

Keywords: Cognitive Development, Cognitive Skills, Early Childhood Education, Self-regulation

Presenting Author:Deborah Pino-Pasternak, University of Canberra, Australia; **Co-Author:**Debora Valcan, Murdoch University, Australia; **Co-Author:**Helen Davis, Murdoch University, Australia

Executive functioning (EF) and self-regulated learning (SRL) are established predictors of academic achievement, both concurrent and future. Although theoretical links have been proposed between the two, to date, very few empirical studies have investigated the relation between EF and SRL, particularly in early childhood and in an Australian context. The present study addresses this gap by investigating the longitudinal association between children's EF and SRL during the first two years of compulsory education in Western Australia. We also tested whether EF and SRL could be construed as manifestations of a common factor. Children's EF was assessed using a battery of tasks tapping working memory, inhibition, and shifting, and their SRL was assessed by teachers using the Children's Independent Learning Development scale. Cross-lagged structural equation modelling analyses were conducted on a longitudinal dataset of 176

children at the end of kindergarten and one year later. EF predicted SRL longitudinally ($r = .43$, controlling for kindergarten SRL), but SRL did not predict EF. However, the common factor model also fit the data very well. We concluded that EF and SRL are related empirically and that further evidence is needed to understand the degree of context specificity of our findings.

Self-regulation in instructional and guided play: Insights from pre-kindergarten classrooms in Chile

Keywords: Cognitive Development, Cognitive Skills, Culture, Self-regulation

Presenting Author: Valeska Grau, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Amaya Lorca de Urarte, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Carolina Araya, Pontificia Universidad Católica de Chile, Chile

Despite the growing interest that playfulness has attracted in recent years, we still lack consistent evidence regarding the advantages of play-based approaches and the way in which they should be implemented to promote children's development in educational contexts. Guided play has been claimed to be the most effective way to approach play pedagogy, as it balances autonomy and educational purposes. However, no comparison has been made in terms of self-regulation. Fifty-eight pre-school classrooms (4-5-year-old children) from different socio-economic backgrounds in Chile were videotaped during a whole school day. Playful episodes were identified and coded in relation to Weisberg's et al (2015) categorization of types of play (instructional, co-opted, guided and free-play). Twelve classrooms presented instructional and guided play, and they were further analysed in terms of opportunities for children's self-regulation and the degrees of playfulness, autonomy and nature of learning during the activity. Results show significant differences between guided and instructional play in terms of child initiation/control of the activity and emergent learning. However, there were not significant differences in the playfulness dimension. Also, there were consistently more opportunities to self-regulate during guided play compared to instructional play. During instructional play, the main self-regulatory activity was monitoring (instructions, performance, change in rules), whereas children in guided play episodes exhibited a wider range of self-regulatory behaviors such as planning, monitoring, regulation (activity, performance and social issues), regulation (behaviours, task, social relationships and strategies). These results are coherent with the claim regarding the advantage of guided play in early years education.

Session Y 9

27 August 2021 14:30 - 15:30

Session Room 4

Single Paper

Higher Education, Motivational, Social and Affective Processes

Motivation and Self-efficacy

Keywords: Collaborative Learning, Communities of Learners, Competencies, Educational Attainment, Emotion and Affect, Higher Education, Mathematics, Motivation, Qualitative Methods, Quantitative Methods, Self-efficacy

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion

Chairperson: Claudia Schreiner, University of Innsbruck, Austria, Austria

Self-efficacy, emotions, and peer support of university students during the COVID-19 pandemic

Keywords: Collaborative Learning, Communities of Learners, Emotion and Affect, Higher Education

Presenting Author: Jasperina Brouwer, University of Groningen, Netherlands; **Co-Author:** Liga Klavina, University of Groningen, Netherlands; **Co-Author:** Marloes Huis, University of Groningen, Netherlands; **Co-Author:** Hanke Korpershoek, University of Groningen, Netherlands

On March 15th, 2020, the Dutch government announced an "intelligent" lock-down in order to limit the spread of COVID-19 virus. As a result, universities were closed and all lectures and exams continued online. The lock-down interrupted the adjustment process to university, particularly for first-year students. The primary goal of this study was to understand how the transition to online learning affected the first-year students. In the academic year of 2019-2020, we collected longitudinal data within a larger project about learning communities. Within this project ($N = 204$), 34 first-year students from a social sciences study programme, filled out a survey at the beginning of the academic year (October 2019) and a few weeks after the transition to online teaching (April 2020). We measured academic self-efficacy, study-related worries, perceived support from the learning community, positive emotions (happiness, hope, pride) and negative emotions (worry, loneliness, and stress). We also assessed whether and how students stayed in touch with their peers, and how their study habits changed (an open question). The paired samples *t*-tests indicated that only the average level of positive emotions decreased. No significant changes were found with regard to academic self-efficacy, study-related worries, and negative emotions. Students appeared to cope well by staying in contact with their peers via different online tools. Nevertheless, the open questions indicated that the COVID-19 measures changed students' study habits (78%), and students stated that they were more distracted (42%) and less motivated (46%) after the transition to online learning.

Student-Teacher Relationships Drive Student Help-Seeking from Teachers for Math Learning Challenges

Keywords: Higher Education, Mathematics, Qualitative Methods, Self-efficacy

Presenting Author: Kevin Jarbo, Carnegie Mellon University, United States; **Co-Author:** Nikki Lobczowski, Carnegie Mellon University, United States; **Co-Author:** J. Elizabeth Richey, Carnegie Mellon University, United States; **Co-Author:** Elise Morton, Georgia Institute of Technology, United States; **Co-Author:** Kenneth R. Koedinger, Carnegie Mellon University, United States

Overcoming past adversity can inform strategies for facing future challenges. To address math learning difficulties, students use structural and interpersonal resources to pursue math learning goals. How a student perceives and appraises prior math learning experiences may influence which resources they use and how they approach new obstacles. During focus group discussions, students reflected on past struggles learning math and how they overcame challenges toward math-related goals. Students shared positive and negative prior experiences that subsequently impacted their strategies for achieving success in math. We first examined clusters of co-occurring segment codes to identify common prior math learning experiences related to using resources to facilitate math learning success. Next, we conducted a thematic analysis on segments where students discussed experiences and resources used to more fully characterize links between student experiences and their future math learning approaches. Using this approach, we identified several themes related to student perceptions of their math learning environment and resources. We focus on two key findings showing that interactions with math instructors were critical in 1) positive perceptions of prior math learning experiences that boosted students' sense of self-efficacy and help-seeking and 2) negative perceptions that diminished students' willingness to persist in math, admit math learning struggles, and seek help. Our findings elucidate how students make meaning of social interactions with math instructors that influence students' approach toward, or avoidance of, interpersonal forms of support to achieve math learning success. The findings also highlight ways instructors can better support student math learning endeavors.

Dynamic relations of achievement goal orientations with daily experiences of success and failure

Keywords: Competencies, Educational Attainment, Motivation, Quantitative Methods

Presenting Author: Florian Schmiedek, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:** Judith Dirk, Deutsches Institut für Internationale Pädagogische Forschung (DIPF), Germany; **Co-Author:** Andrea Schmidt, Deutsches Institut für Internationale Pädagogische Forschung (DIPF), Germany; **Co-Author:** Andreas B. Neubauer, Deutsches Institut für Internationale Pädagogische Forschung (DIPF), Germany

Achievement goals have been linked to achievement in various educational settings. The present work explored day-to-day variations in achievement goal orientations (mastery, performance-approach, performance-avoidance) and their associations with intrinsic motivation in school and daily experiences of success and failure. Ambulatory assessment data from 108 students in Grade 5 were collected, with four weeks of daily assessments of achievement goal orientations in the morning, intrinsic motivation at school, and end-of-day reports of academic success and failure. Multilevel models showed that children reported more intrinsic motivation and more success on days when they reported greater mastery goal orientation. Mastery goal orientations were also linked to better academic achievement one year later. Performance-avoidance orientation was associated with more failure on the same day. Dynamic structural equation models indicated reciprocal associations between goal orientations and experiences of success and failure across days. Findings suggest meaningful within-person dynamics among goals orientations and daily academic success and failure.

Session Y 10

27 August 2021 14:30 - 15:30

Session Room 12

Single Paper

Higher Education

Student Learning and Teaching

Keywords: Design-based Research, Engineering, Higher Education, Mixed-method Research, Self-regulation, Student Learning, Teaching/Instruction

Interest group: SIG 04 - Higher Education

Chairperson: Jarkko Hautala, Niilo Mäki Institute, Finland

Student-centred learning environments promoting regulated learning: A mixed-methods approach

Keywords: Mixed-method Research, Self-regulation, Student Learning, Teaching/Instruction

Presenting Author: Juulia Lahdenperä, Häme University of Applied Sciences, Finland; **Co-Author:** Johanna Rämö, University of Helsinki, Finland; **Co-Author:** Liisa Postareff, HAMK University of Applied Sciences, Finland

The importance of students' regulation of learning in higher education has been acknowledged in the literature, but research approaching regulation of learning from the perspective of learning environments is scarce. The aim of the present study is to broaden the socio-cognitive perspective by shifting the attention from an individual learner to the learning environment. The study deepens our understanding of how learning environments can promote regulated learning and takes a mixed-methods approach to investigate the same students in two parallel but pedagogically different student-centred learning environments. The quantitative measurement of students' course-level self-regulation of learning (N=91) shows that the learning environments are distinguished by the factor measuring lack of regulation. This is elaborated further with a qualitative analysis of student interviews (N=16). The results indicate that unregulated learning is created by out-of-reach teaching and tasks causing challenges in goal setting and motivation. In contrast, providing co-regulation of learning in the form of scaffolding and a positive social environment have a central role in supporting regulated learning. Practical implications for how student-centred learning environments can support students to participate in regulated learning are discussed.

Defining key components of Challenge Based Learning in engineering education: a review study

Keywords: Engineering, Higher Education, Student Learning, Teaching/Instruction

Presenting Author: Karolina Doulougeri, Eindhoven School of Education, Netherlands; **Co-Author:** Jan Vermunt, Eindhoven University of Technology, Netherlands; **Co-Author:** Gunter Bombaerts, Eindhoven University of Technology, Netherlands; **Co-Author:** Michael Bots, Eindhoven University of Technology, Netherlands

Challenge Based Learning (CBL) is a pedagogical approach increasingly adopted in engineering education. Despite its growing practice, there is little consensus in the literature about its key components. We aim to address this gap, by systematically reviewing the empirical literature on the use of CBL in engineering education, published between 2010 and 2020. Four research databases were searched and a final set of 32 relevant articles was identified. Using the spider web curriculum framework, the articles were analyzed according to the rationale, aims and objectives of CBL, the learning activities, materials and resources used, location and time of CBL implementation, teachers' role in learning and assessment. The review findings reveal a great variance in the conceptualization, implementation and assessment of CBL. In all studies, the starting point for students' learning was an open ended and ill-defined socio-technical problem that required the proposal or development of a concrete solution. In complex CBL designs, real stakeholders were involved in all stages of CBL and a multidisciplinary approach was expected for the development of the solution. Students' learning was hands on, collaborative and self-directed, while teachers' role shifted towards coaching. The assessment of students' process and products included formative and summative methods. According to the findings, the adoption of CBL can facilitate engineering students' development and application of content knowledge, development of professional skills and foster students' motivation and engagement in the learning process. Limitations of the review and implications of the findings for educational practice and research are discussed.

Pedagogical Patterns for Seamless Learning in Higher Education

Keywords: Design-based Research, Higher Education, Student Learning, Teaching/Instruction

Presenting Author: Bernadette Dilger, University of St.Gallen, Switzerland; **Co-Author:** Luci Gommers, University of St.Gallen, Switzerland

In the paper we present a study on pedagogical patterns in seamless learning. The pedagogical patterns were developed in a seamless learning program of six different seamless learning projects in different fields in higher education. The single concepts were developed following a Design-Based Research approach. Within this study we analysed the links of problem statements for each concept and the pedagogical principles used to design the seamless learning concepts. The pedagogical pattern approach aims to identify the reflected knowledge of the practice in the design perspective. A strong link can be found between the problem of synthesizing different kind of knowledge and experienced-based learning and problem-based learning. The development of the pedagogical patterns within seamless learning helps to further conceptually and empirically base the design principles in seamless learning. On the one side, this enhances the concept of seamless learning. On the other side, it helps educational practitioners to get guidance in the design of learning environments in dynamic and complex settings.

Session Y 11

27 August 2021 14:30 - 15:30

Session Room 5

Single Paper

Learning and Special Education, Motivational, Social and Affective Processes

Social Interaction in Collaborative Learning

Keywords: Collaborative Learning, Cooperative/Collaborative Learning, Early Childhood Education, Motivation and Emotion, Self-regulation, Social Interaction, Special Education

Interest group: SIG 08 - Motivation and Emotion, SIG 15 - Special Educational Needs, SIG 27 - Online Measures of Learning Processes

Chairperson: Charalambos Charalambous, University of Cyprus, Cyprus

A bodily view of collaboration in asymmetrical peer interactions in early childhood education

Keywords: Collaborative Learning, Early Childhood Education, Social Interaction, Special Education

Presenting Author: Juliene Ferreira, University of Tampere, Finland

This study addresses two important topics in inclusive early childhood education and care, the construction of collaboration among young children and the relevance of exploring such processes in asymmetrical peer interactions through the lenses of embodiment. Collaboration is identified in situations where children are able to share goals and jointly regulate one another's actions towards achieving such goals, which demands high cognitive and metacognitive operations and verbalization of their thoughts, feelings, and emotions. However, this raises the question of how to identify and analyse collaboration in situations where intentions are not verbally revealed or in cases where peers do not share the same cognitive repertoire. This study explores the construction of collaboration in asymmetrical interactions (i.e., between children with intellectual disabilities and their peers with typical development), shifting from a cognitivist approach of social interaction towards an embodied account. A natural early childhood education and care environment served as the research site for video

data collection of 18 episodes of collaboration. A qualitative microanalysis was conducted to identify the elements through which communication was carried out and how, within *participatory sense-making*, collaboration was constituted. The results supported previous studies in which children with typical development predominantly initiated and led the tasks, but they also revealed that engagement was constructed through non-verbal communication rather than direct verbal instructions or guidance and that collaboration was constructed regardless of the objectives of the task, as interaction can take on a life of its own. Implications for inclusive early childhood educational contexts are critically discussed.

Motivational and emotional conditions and socially shared regulation – two sides of the same coin

Keywords: Cooperative/Collaborative Learning, Motivation and Emotion, Self-regulation, Social Interaction

Presenting Author:Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:**Tiina Törmänen, University of Oulu, Finland; **Co-Author:**Tatiana Shubina, University of Oulu, Finland, Finland; **Co-Author:**Jonna Malmberg, University of Oulu, Finland

This paper addresses the function of motivation and emotions in collaborative learning from multiple standpoints. Albeit emotion and motivation regulation are shared between group members, and hence, trackable with the process data, they are founded on individuals' psychological processes that enable shared regulation to emerge. In this paper, we addressed this duality by first, combining micro- and meso-level motivational and emotional conditions with collaborative interactions and second, relating them with socially shared regulation activated in collaborative learning. The data derives from a study carried out in collaborative science lessons of secondary school students (N= 94). Multiple data sources covered group members' subjective motivational and emotional experiences, physiological reactions, and videotaped collaborative working (225h) from a seven-week study period. The results showed that situational motivational and emotional conditions have positive impact on collaborative groups' interaction, which, in turn, invited socially shared regulation. The study illustrates the need to employ multiple measures to reach comprehensively the function of motivation and emotions: psychophysiological measures have a potential to reveal micro-level emotional conditions, while video enables to reach expressed emotions and socially shared regulation. Finally, self-evaluations are needed to understand the students' subjective motivational conditions that influence their interactions and appraisals of the situation. In the presentation, we will discuss the challenges of combining these different data sources that are not one-by-one in terms of the timescale or granularity from both analytical and theoretical point of view.

Process-mining the shared physiological arousal during collaborative problem solving

Keywords: Collaborative Learning, Cooperative/Collaborative Learning, Self-regulation, Social Interaction

Presenting Author:Muhterem Dindar, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland; **Co-Author:**Eetu Haataja, University of Oulu, Finland; **Co-Author:**Ahsen Çini, University of Oulu, Finland

This study examines how electrodermal activity (EDA) of collaborating students correspond to each other in a computer-based collaborative problem solving task. Since a challenge to understand metacognitive level "sharing" in groups, we developed a method that can identify the shared physiological arousal events among the group members. In order to understand what happens during shared arousal events, we video-coded those moments in terms of basic cognitive problem solving processes (i.e. understanding and exploring, representing and formulating, planning and executing, monitoring and reflecting), socio-emotional expressions and off-task behavior. Our findings show that shared arousal events mostly refer to basic cognitive processes in problem solving and socio-emotional expressions rather than off-task behavior. Further, we conducted a process-mining analysis to compare low and high scoring groups in terms of their video coded-behaviors during the shared arousal events. We found significantly different interactional patterns for the low and high scoring groups. Overall, the current study contributes to the literature from both methodological and theoretical aspects and underline the importance of process-oriented methods in understanding the core processes and quality of collaboration.

Session Y 12

27 August 2021 14:30 - 15:30

Session Room 18

Single Paper

Teaching and Teacher Education

Educational Psychology in Teacher Professional Development

Keywords: Achievement, Competencies, Educational Psychology, Pre-service Teacher Education, Teacher Professional Development

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Janina Roloff-Bruchmann, IPN - Leibniz Institute for Science and Mathematics Education, Germany

Entry characteristics of student teachers and their academic success. A person-centered approach

Keywords: Competencies, Educational Psychology, Pre-service Teacher Education, Teacher Professional Development

Presenting Author:Antje Biermann, Saarland University, Germany; **Co-Author:**Julia Karbach, University of Koblenz-Landau, Germany; **Co-Author:**Frank Spinath, Saarland University, Germany; **Co-Author:**Roland Bruenken, Saarland University, Germany

The prediction of academic success in teacher education based on individual characteristics is of great importance to optimize student counseling. In the present study, we realized a person-centered approach with N=624 student teachers for secondary schools of a German university. We assessed individual characteristics at the start of studies (GPA, personality, occupational motivation) to predict different variables for academic success (final grade, satisfaction with studies, experiencing and coping with stress, teacher self-efficacy). For the person-centered approach, we used a latent profile analysis and identified three profiles. In a second step we calculated group differences regarding academic success. One group shows disadvantageous entry characteristics, has lower self-efficacy and deals more poorly with stress than the remaining groups. We discuss the findings against the background of student counseling and supporting students during teacher studies.

How skilled are future teachers in the domains of learning, thinking, reading and ICT literacy?

Keywords: Achievement, Competencies, Educational Psychology, Teacher Professional Development

Presenting Author:Gyongyver Molnar, University of Szeged, Hungary

The present study aims to monitor the quality of future teachers in the domains of basic literacy, learning, thinking, and information and communication technologies. Participants of the study were students admitted to a large Hungarian university starting their studies between 2018 and 2020. In the present analysis, we focused on and compared the results of students in teacher education with those of their non-teacher education peers studying at the same faculty. Beyond a learning strategy questionnaire, reading literacy, mathematical reasoning, inductive reasoning, ICT literacy and dynamic problem-solving tests were prepared for the assessment as a measure of 21st-century skills. The reliabilities of the tests and questionnaire were high, with Cronbach's alpha varying between 0.72 and 0.94. Future teachers proved to be no more effective learners than their peers at university; moreover, independent of the level of teaching, they use the non-effective memorisation strategy with significant frequency ($p < 0.05$), which is clearly to be avoided in the 21st century. The instrumental motivation of the lower elementary teachers was the highest. However, this group showed the lowest achievement on average in each of the domains. Future subject teachers achieved significantly higher than future lower elementary teachers in each domain, but significantly lower than students in the non-teacher education group in thinking and reasoning skills. The results indicate the importance of developing literacy, thinking skills and learning strategies even at university level, especially in teachers.

Session Y 13

27 August 2021 14:30 - 15:30

Session Room 1

Single Paper

Educational Policy and Systems

Quantitative Methods in Primary Education

Keywords: Educational Attainment, Emotion and Affect, Higher Education, Primary Education, Quantitative Methods, Teaching/Instruction

Interest group: SIG 18 - Educational Effectiveness and Improvement

Chairperson: Stefanie Rach, Germany

Teacher well-being in Taiwan: from real-time experience in class to general well-being

Keywords: Emotion and Affect, Primary Education, Quantitative Methods, Teaching/Instruction

Presenting Author: Pei-Hsin Li, University of Oxford, United Kingdom; **Co-Author:** Diane Mayer, University of Oxford, United Kingdom; **Co-Author:** Lars-Erik Malmberg, University of Oxford, United Kingdom

Teachers' well-being is not only crucial for teachers' careers but also for their students' learning and well-being. Also, teacher well-being is associated with their emotion which further associates with students' engagement in class. Previous research has focused mostly on how teachers' actions are related to students' emotion and well-being, we in this study focus on primary school home-room teachers' real-time emotions and teaching experiences (every lesson during a five-day period), daily end-of-working day well-being, and general well-being. Doing so, we go beyond previous cross-sectional and longer-term longitudinal studies on teachers' well-being in Taiwan. Using experience sampling, 20 teachers who taught grade 4 or 5 completed electronic questionnaires at the end of each lesson (average responses per teacher $M = 13.15$, $SD = 1.95$, Range=9-16 Total ndt =263), brief end-of-working well-being ($M = 4.5$, $SD = .607$, Range=3-5 Total ndt = 90), and a survey of teachers' general well-being ($n = 20$). Specifying multilevel (lessons nested in days nested in teachers) path-models we found stability of daily well-being from day to day, variable emotions from lesson to lesson, and individual differences in teachers' weekly emotions. Students' disengagement predicted higher negative emotion, while teacher support predicted higher positive emotion. Weekly positive emotions were associated with life-satisfaction and harmony belief, reflecting socio-cultural values in Taiwan. This study implies that positive experiences matter to teachers, and when teachers with higher well-being facing disruptions at work, these will not thwart their well-being.

How did Covid-19 related lockdowns affect learning at different levels of education?

Keywords: Educational Attainment, Higher Education, Primary Education, Quantitative Methods

Presenting Author: Martijn Meeter, Vrije Universiteit Amsterdam, Netherlands

Due to the COVID-19 pandemic, schools and other educational institutions had to shut their doors and shift to online education. Here, we review how these shutdowns impacted learning, using our own and other's data sets from Dutch primary schools, secondary schools and a university. At the primary school level, there is strong evidence from extant studies using standardized tests that students, on average, did not learn as much during the first shutdowns in spring 2020 than they would otherwise have. However, online platform data on mathematics learning suggest the opposite: if anything, stronger learning during the shutdowns than in the year before. These gains were then largely erased in the post-lockdown period. Both data sets do agree that educational inequality increased during the lockdown – not in that weak learners fell further behind (they did not), but in that students from socio-economically disadvantaged households did worse than other students. At the university level, no evidence was found for students falling behind. This gradient, with clear evidence of learning decrements in primary school students and little or no decrements in older students, contrasts with evidence for greater social-emotional problems in older children and young adults during the lockdown than in younger children.

Session Y 14

27 August 2021 14:30 - 15:30

Session Room 6

Single Paper

Assessment and Evaluation, Teaching and Teacher Education

Science Education

Keywords: Achievement, Cognitive Skills, Mathematics, Meta-analysis, Quantitative Methods, Science Education

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Nadine Schiomske-Bodenstein, Germany

Assessing control of variables strategy in physics of high school students

Keywords: Achievement, Cognitive Skills, Quantitative Methods, Science Education

Presenting Author: De Van Vo, University of Szeged, Doctoral School of Education, Hungary

Control of variables strategy (CVS) is the main component of scientific reasoning related to evaluating an experimental system and deducing valid conclusions. This study aims to develop, validate, and investigate the difference in students' performance in CVS strategy in physics. The test contains 24 items measuring three subskills of CVS in basic physics: identifying controlled experiments, interpreting the outcome of a controlled experiment, and understanding the determinacy of confounded experiments. The study assessed a random sample of 470 students from the 10th, 11th, and 12th grades in nine public high schools in Vietnam. Most of the items fitted well to the data in the Rasch model measurement. No statistically significant difference with respect to gender was found in all items in term of differential item functioning. The older cohorts tended to earn higher scores than their younger ones on the test. Boys did not differ girls on the CVS test through grade levels, except in understanding the determinacy of confounded experiments, favouring for males. The test performs as a great potential tool for evaluating CVS in basic physics at high school. The educational implications for developing a CVS test and enhancing CVS skills of students in schools are also discussed.

Effective Science and Mathematics Teaching: an overview of meta-analyses

Keywords: Achievement, Mathematics, Meta-analysis, Science Education

Presenting Author: Maximilian Knogler, Technical University of Munich (TUM), Germany; **Co-Author:** Andreas Hetmanek, Technical University of Munich (TUM), Germany; **Co-Author:** Tina Seidel, Technische Universität München, Germany

The idea of research informing practice is receiving a great emphasis in educational science. A crucial first step in a process which may eventually lead to an evidence-based practice is the identification of an appropriate evidence base. The recent proliferation of empirical research particularly in fields like STEM education, suggests that with the expansion of research there comes a more solid and differentiated evidence base that bears relevance even for more specific fields of practice. With this study, we seek to test this assumption by identifying an evidence base for a specific field of practice: Mathematics and science teaching for secondary students. As researchers generally agree that aggregated research findings are superior to individual studies, our aim is to identify aggregated effect sizes from recent meta-analytic research (since 2004). An extensive database search yielded 42 meta-analyses reporting aggregated effect sizes for instructional interventions (e.g. digital applications, inquiry learning etc.) on student learning outcomes specific for STEM subjects and secondary student populations. These included 77 effect sizes specific to both STEM subjects and secondary students. The availability of a substantial number of specific aggregated effect sizes also allowed testing differences between these specific and more general findings (overall effect sizes). Results showed that in most cases overall effects did not differ from specific

aggregated effects and may thus provide some orientation even for more specific questions. All in all, our results demonstrate that current research offers expanding evidence based on aggregated effect sizes covering various kinds of interventions suitable for secondary STEM classrooms.

Session Y 15

27 August 2021 14:30 - 15:30

Session Room 8

Roundtable

Learning and Instructional Technology, Teaching and Teacher Education

Teaching and Teacher Education

Keywords: Citizenship Education, Collaborative Learning, Competencies, Educational Technology, Instructional Design, Learning Technologies, Teaching Approaches, Teaching/Instruction

Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education

Chairperson: Chiara Pecini, University of Florence, Italy

Exploring learning and teaching in interdisciplinary educational designs for future citizens

Keywords: Collaborative Learning, Instructional Design, Learning Technologies, Teaching/Instruction

Presenting Author: Anniken Furberg, University of Oslo, Norway; **Presenting Author:** Kenneth Silseth, University of Oslo, Norway; **Presenting Author:** Andreas Lund, University of Oslo, Norway; **Co-Author:** Hans Christian Arnseth, University of Oslo, Norway; **Co-Author:** Ole Andreas Kvamme, Department of Teacher Education and School Research, University of Oslo, Norway; **Co-Author:** Ingvill Rasmussen, Department of Education, Norway; **Co-Author:** Kari Anne Rødnes, University of Oslo, Norway; **Co-Author:** Elin Sæther, University of Oslo, Department of Teacher Education and School Research, Norway; **Co-Author:** Kristin Vasbø, University of Oslo, Department of Teacher Education and School Research, Norway

In August 2020 the curriculum reform 'The subject renewal' (LK20) was implemented in Norway. In this curriculum, there is an emphasis on competences such as creativity, exploration and transforming ideas into practical solutions connected to societal themes involving interdisciplinary approaches in the separate school subjects. The Faculty of Educational Sciences, University of Oslo, was recently commissioned to perform a comprehensive research-based evaluation of the implementation of LK20 by the Norwegian Directorate for Education and Training. In this project, we will investigate the renewed curriculum on a policy level, leadership level, and how it is enacted in classrooms. The present paper focuses on how LK20 is encountered and responded to by teachers and students in classroom settings. The overall aim of the project is to provide an understanding of the educational opportunities and challenges teachers and students face when LK20 is introduced. Six case-studies, involving students and teachers taking part in interdisciplinary learning designs, at six secondary schools will be carried out in the period of 2021-2024. The significance of the study is found in its examination of how teachers and students cope with interdisciplinary curricular requirements and how digitalization is put to use in their efforts. Such insights will generate knowledge that can guide teachers and teacher educators in their work on interdisciplinarity in future schools and fostering citizenship for an increasingly complex and changing world. In this roundtable session, we would like to engage the participants in a discussion of our research focus, research design, and analytical approach.

Implementing and testing a gender-free curriculum for the development of digital citizenship

Keywords: Citizenship Education, Competencies, Educational Technology, Teaching Approaches

Presenting Author: Ania Tadlaoui-Brahmi, HEP Fribourg, Switzerland

On the political level, the current trend in public schools in French-speaking side of Switzerland is to integrate digital citizenship skills for the new K-12 study plan (CIIP, 2020). Faced with the complexity of digital environments, recent studies conclude that there is an urgent need to develop digital citizenship skills among students (Curran et Ribble, 2017). In terms of gender, the Swiss labor market is not gender-neutral. These gender disparities can be seen in particular in the digital professions (Collet, 2019). This phenomenon is explained by the dichotomization of epistemological fields (Hurtig, 1998), which refers to the sexuation of representations and expectations related to knowledge (Marro, 2010). Faced with this, the implementation of a non-gendered digital education in primary school is a decisive factor in opening new professional horizons for everyone. To test if a gender-free curriculum about digital citizenship can be influence, a gender-free material has been created, instructional design has been used, with a focus on gender-free characters, names... The research questions are formulated as follows: Q1. How a gender training modify teachers' gendered perceptions and practices ? ; Q2. How implementing digital citizenship materials modify students' perceptions of digital environments ? ; Q3. How implementing non- gendered digital citizenship materials modify students' relationship to knowledge according to their gender ? The ambition of these investigations is to identify the challenges of digital education from a gender perspective in order to moving this discipline towards greater equality.

Session Y 16

27 August 2021 14:30 - 15:30

Session Room 3

Roundtable

Cognitive Science, Higher Education

Higher Education

Keywords: Educational Psychology, Higher Education, Learning Approaches, Neuroscience, Problem Solving, Qualitative Methods, Self-regulation, Student Learning, Workplace Learning

Interest group: SIG 04 - Higher Education, SIG 22 - Neuroscience and Education

Chairperson: Tim Mainhard, Utrecht University, Netherlands

Exploring Students' Critical Thinking in Undergraduate Theses in the Discipline of Education

Keywords: Higher Education, Learning Approaches, Qualitative Methods, Student Learning

Presenting Author: Max Scheja, Stockholm University, Sweden

This session reports on findings from a study exploring undergraduate students' ways of thinking and practising within education as a discipline, focusing particularly on what stand out as characteristic features of critical thinking in this particular subject area. The study forms part of a larger research project investigating different aspects of critical thinking as these are manifested in students' undergraduate theses within four different disciplines: Education, History, Literature and Psychology. The project draws on 809 student papers assessed in the Swedish quality assurance evaluation that took place 2011-2014. The present study offers a careful qualitative analysis of a randomized sample of 40 undergraduate theses in Education from 14 universities in Sweden, including theses graded from 'low pass' to 'pass with distinction'. Extracts of students' ways of reasoning are used to develop a discussion of critical thinking that connects more general ideas of such thinking as involving general dispositions and thinking skills, to more context specific concerns focusing on disciplinary patterns in students' ways of thinking and practising as these are communicated in undergraduate theses. A fundamental purpose of higher education involves supporting students in becoming critical thinkers. Yet critical thinking remains notoriously difficult to define. Investigating how students express their academic understandings in undergraduate theses can contribute to clarifying notions of critical thinking underscoring aspects that may be of particular value in relation to the intended learning outcomes of a particular curriculum, thus providing a basis for supporting students' development of academic understandings in relation to such learning outcomes.

Developing a model for self-regulated learning in a higher education medical workplace environment

Keywords: Educational Psychology, Higher Education, Self-regulation, Workplace Learning

Presenting Author:Evelyn Steinberg, Vetmeduni Vienna, Austria; **Co-Author:**Franziska Perels, Saarland University, Germany; **Co-Author:**Ulrike Auer, Vetmeduni Vienna, Austria; **Co-Author:**Lukas Schwarz, Vetmeduni Vienna, Austria

Theoretical framework: Higher education students need high competences in self-regulated learning (SRL), not only in the academic setting, e.g. while learning for exams, but also in the practical setting when facing real-life situations. Many students struggle to transition from an academic setting to a practical setting and some struggle even later when they are already familiar with the practical setting. While there is a considerable body of research on students' SRL with the focus on knowledge acquisition in an academic setting, little attention has been paid to higher education students' SRL in the practical setting. We aim to fill the gap in the understanding of SRL in the practical setting and especially in the clinical practical setting of medical students. Our study is based on Zimmerman's social cognitive model (2000) which describes SRL as a dynamic process including motivational, cognitive and meta-cognitive subprocesses. **Objective:** Specifying an SRL model that fits the clinical practical setting (SRL_C model). **Methods:** We will combine a participative approach in which SRL researchers work together with representatives of layman stakeholders (students, teachers, clinicians) with a multi-method approach by conducting interviews, questionnaires and focus groups. **Focus of roundtable session:** In the roundtable session, we hope to get feedback on a draft of the SRL_C model from researchers outside the project team before we conduct the focus group method. Additionally, we aim at discussing the model with regard to a subsequent step of the project which is developing a diary including single item measurement.

The Physiological Mechanisms of Learning through Productive Failure

Keywords: Higher Education, Learning Approaches, Neuroscience, Problem Solving

Presenting Author:Cléa Formaz, ETH Zurich, Switzerland; **Co-Author:**Venera Gashaj, Swiss Federal Institute of Technology ETH Zurich, Switzerland; **Co-Author:**Dragan Trnnic, Swiss Federal Institute of Technology ETH Zurich, Switzerland; **Co-Author:**Manu Kapur, ETH Zurich, Switzerland

Productive Failure is a learning design that creates conditions for learners to persist in generating and exploring representations and solution methods for solving complex, novel problems prior to formal instruction. There is a growing body of evidence that problem-solving followed by instruction can lead to better conceptual understanding and knowledge transfer, compared to instruction followed by problem-solving. This learning advantage occurs even in the face of initial failure to solve the problem. Research on productive failure yielded a number of cognitive mechanisms for why students learn better after encountering difficulties; however, the physiological mechanisms underpinning this process have yet to be explored. Recent research suggests a connection between heartbeats and cognitive processes, offering a novel method for investigating the physiological mechanisms of learning. Here, we introduce a novel means to explore the physiological mechanisms underlying the process of learning from failure, and argue for its usefulness. In particular, we aim to build a deeper explanatory basis of productive failure by exploring the impact of different heartbeat measurements and corroborating these measurements with behavioral signatures.

Session Y 17

27 August 2021 14:30 - 15:30

Session Room 15

Invited Symposium

Teaching and Teacher Education

SIG 16: How teachers think about SRL and judge SRL in students

Keywords: Metacognition, Primary Education, Secondary Education, Self-efficacy, Self-regulation, Teacher Professional Development, Teaching Approaches, Teaching/Instruction

Interest group: SIG 16 - Metacognition

Chairperson: Janneke van de Pol, Utrecht University, Netherlands

Organiser: Janneke van de Pol, Utrecht University, Netherlands

Organiser: Charlotte Dignath, Germany

Discussant: Mariette van Loon, University of Bern, Switzerland

Self-regulated learning (SRL) is a major competence for students in order to learn effectively. As research has shown that students can learn to self-regulate their learning through strategy training, teachers are supposed to support their students' self-regulation of learning. To promote individual students' SRL adaptively, teachers need to: (1) dispose of knowledge about (fostering) SRL in the classroom, and (2) be able to accurately judge students' ability to self-regulate their learning. Yet, little is known about these essential teacher skills. Therefore, the goal of this symposium is to bring together research with a diversity of innovative methods to capture teachers' knowledge and skills about judging and fostering SRL in primary and secondary school students. The first study presents an instrument to assess teachers' knowledge about students' SRL and about approaches to foster SRL in students effectively. The second study has investigated how teachers' judge their students' monitoring of their own learning and presents a conceptual framework to study these judgments. The third study has examined whether the impact of students' self-evaluation biases on teachers' judgments of their competence could be mediated by teachers' judgments about their students' self-regulation abilities. The fourth study presents an instrument to assess teachers' accuracy in judging student's use of SRL strategies. This symposium will deliver new insights into teachers' knowledge and judgment of SRL in students as well as instruments and a conceptual framework that can ignite further research on this vital topic.

Assessing Teachers' Professional Knowledge about Self-regulated Learning

Presenting Author:Yves Karlen, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland; **Co-Author:**Carmen Hirt, University of Applied Sciences and Arts Northwestern Switzerland (FHNW), Switzerland; **Co-Author:**Silke Hertel, Ruprecht-Karls-Universität Heidelberg, Germany

Teachers play a crucial role in students' development in self-regulated learning (SRL). Teachers' professional competences, such as their professional knowledge, beliefs, and motivation, influence their SRL instructions. In particular, teachers' pedagogical content knowledge (PCK) improves their teaching quality and thus influences students' learning processes. There is no standardized instrument that measures teachers' PCK about SRL (PCK-SRL). The study aims to develop and explore a new scenario-based assessment that captures teachers' PCK-SRL. Data were collected from 106 in-service teachers (main sample) and 79 preservice teachers. Results show that the newly developed instrument to assess teachers' PCK-SRL is reliable. Further, first results support the validity of the instrument. PCK-SRL correlated positively but only slightly with teacher content knowledge (CK-SRL) and beliefs about SRL. Regression analysis revealed that besides teachers' self-efficacy about SRL, PCK-SRL was an essential predictor for their self-reported SRL promotion. Finally, we found significant differences in PCK-SRL between a subsample of in-service teachers and preservice teachers. This instrument helps gain further insight into why teachers might or might not promote SRL in class. Further research should look at how teachers can be supported in developing their PCK-SRL and in transferring their knowledge into meaningful instructional SRL activities.

Teachers' Judgment Accuracy of Students' Monitoring: A Conceptual Framework and Descriptive Study

Presenting Author:Janneke van de Pol, Utrecht University, Netherlands; **Co-Author:**Sophie Oudman, Utrecht University, Netherlands

Accurate monitoring of one's own learning is pivotal for students' academic success; yet their monitoring is often inaccurate. To further improve students' monitoring, teachers could help their students. To do this effectively, teachers need an accurate idea of students' monitoring. Most research, however, has focused on teachers' judgments of students' *performance*, not of students' *monitoring*. We present a conceptual framework that integrates teachers' judgments of students' performance and monitoring and explore how (accurately) teachers make these judgments. Students (N=406; M_{age}=15.15) judged their own performance on a reading comprehension test and teachers (N=46) judged students' test performance and monitoring judgments. Teachers thought students were highly accurate in monitoring their own performance. Yet, they misjudged students' self-monitoring judgments with 19% on average (7.71% overestimation). Teachers' judgments of students' monitoring judgment accuracy were inaccurate for 65% of the students. However, the *degree* of misjudgment

was moderate: teachers misjudged students' monitoring accuracy with, on average 14%. The results showed that there is room for improvement in teachers' skills to judge students' monitoring (accuracy). Teachers used diagnostic cues when making accurate performance judgments. For accurate judgments of students' monitoring, they additionally used non-diagnostic student cues which, however, did not seem to harm their judgment accuracy. Yet, ignoring those cues may further improve these judgments. The conceptual framework can ignite further research on this vital topic and the descriptive results provide a first impression of teachers' skills of judging students' monitoring.

The illusion of incompetence is a burden for children: self-evaluation biases and school judgment

Presenting Author: Anne-Laure de Place, Université Grenoble Alpes, France; **Co-Author:** Rebecca Lévesque-Guillemette, Université du Québec à Montréal, Canada; **Co-Author:** Andréa-Ann Labranche, 2Université du Québec à Montréal, Canada; **Co-Author:** Therese Bouffard, Université du Québec à Montréal, Canada; **Co-Author:** Pascal Pansu, Université Grenoble Alpes, France

This paper aims to clarify the determinants of teachers' school judgment. Although numerous studies demonstrated that scholastic variables (performance, school context, scholastic history, etc.) and socio-demographics variables (gender, socio-economic background) were related to teachers' judgment of their students' scholastic competence, only a few examined the link between students' self-evaluations biases and school judgment. Overall, these studies showed that teachers judged students who overestimate themselves to be better than others (e.g., de Place et al., 2019; Lévesque-Guillemette et al., 2015). In the present study, conducted in a sample of 661 sixth-graders and their 53 teachers, we aimed to examine the way this relationship unfolds, by measuring the potential mediating impact of teachers' perception of their students' self-regulation capacities, as well as the moderating role of teachers' perception of a conflictual teacher/student relationship. The results confirm the link between students' self-evaluation biases and teachers' school judgment. This relation is both direct and indirect: it is partially mediated by teachers' perception of their students' self-regulation level. Teachers' perception of a conflictual teacher/student relationship moderates the direct link between students' self-evaluation biases and their school judgment; this link is weaker when the relationship is conflictual. These findings could guide reflection on teaching practices, for instance through the implementation of attributional retraining programs, designed to transform students' dysfunctional attributions (e.g., the illusion of incompetence) into functional ones.

Assessing teachers' diagnostic skills for applying the use of self-regulatory strategies

Presenting Author: Charlotte Dignath, DIPF Leibniz Institute for Education Research Frankfurt, Germany; **Co-Author:** Phuc Tran Lu, Goethe-Universität Frankfurt am Main, Germany; **Co-Author:** Mareike Kunter, DIPF | Leibniz Institute for Research and Information in Education, Germany

There is a consensus that self-regulated learning (SRL) positively affects achievement and motivation. Therefore, teachers are supposed to foster their students' self-regulation (SR) of learning by providing them with SR strategies. However, in order to support their students' SRL, teachers need to diagnose their students' SR competence first. The aim of this study was to develop and test an instrument that serves to assess teachers' accuracy in diagnosing students' SR competence. On the lines of the principle of a simulated classroom, the instrument provided teachers with information of fictive students regarding their use of SR strategies. The material consisted of a fictive (a) strategy interview, (b) entry from a learning journal, and (c) thinking-aloud protocol, and each covered three levels of SR competence. The mastery coding was validated with an expert coding. Next, a sample of 82 teachers were presented with the test: they had to identify student utterances that were indicators for SR strategy use, and to rank the students according to their SR competence. The instrument manifested satisfying internal consistency and item difficulties. As the results show, 2/3 of the teachers ranked the students' SRL competence correctly. Furthermore, on average they judged 24 out of 35 utterances as indicator for strategy use correctly. Teachers' prior knowledge was correlated with teachers' accuracy to identify students' SRL. No differences were found between preservice and in-service teachers' accuracy in the test. The results provide first insights into teachers' accuracy to diagnose their students' SRL competence.

Session Z 1

27 August 2021 15:45 - 16:45

Session Room 7

Poster Presentation

Learning and Instructional Technology, Motivational, Social and Affective Processes, Teaching and Teacher Education

Motivation, Emotion and Metacognition

Keywords: Assessment Methods and Tools, Attitudes and Beliefs, Comprehension of Text and Graphics, Content Analysis, E-Learning/Online Learning, Educational Psychology, Emotion and Affect, Goal Orientation, In-service Teacher Education, Meta-analysis, Metacognition, Motivation, Motivation and Emotion, Peer Interaction, Science Education, Secondary Education, Survey Research

Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education, SIG 16 - Metacognition

Chairperson: Lina Markauskaite, University of Sydney, Australia

Teacher Value Messages Predict Greater Engagement through Expectancy, Value, and Cost Beliefs

Keywords: Attitudes and Beliefs, Motivation, Motivation and Emotion, Science Education

Presenting Author: Dave Putwain, Liverpool John Moores University, United Kingdom; **Co-Author:** Andrea Mallaburn, Liverpool John Moores University, United Kingdom

Expectancy Value Theory (EVT) has shown that educational choices, engagement, and achievement, are determined by beliefs about expectancy of success and subjective task value. Beliefs about cost, however, and the value communicated to students by teachers, have not been widely studied. In the present study we examined a mediated moderation model whereby teacher value messages (TVMs) predicted expectancy-value-cost beliefs which in turn predicted behavioural and emotional engagement. Data were collected from 820 Year 8 and 9 secondary school students aged 12-14 years. Participants reported TVMs, expectancy-value-cost beliefs about science, and engagement in science lessons. TVMs were positively related to expectancy and value, and negatively related to cost. Behavioural engagement was predicted by the expectancy-value interaction and cost. Emotional engagement was predicted by the expectancy-value interaction only. TVMs were directly related to greater engagement, and indirectly through higher value (more strongly for those with higher expectancy) and lower cost. Theoretically, these results highlight the added benefit of considering cost in EVT and in identifying a source of value in the classroom. Educationally, results imply that discussing the value of science with students will have beneficial effects for motivation and engagement.

Italian university students' learning experience during COVID-19 forced online education

Keywords: Content Analysis, E-Learning/Online Learning, Emotion and Affect, Metacognition

Presenting Author: Giulia Vettori, University of Florence, Italy

This study was developed to understand Italian university students' learning experiences of online university courses during COVID-19 restrictions and to gain knowledge about strategies they have adopted to overcome learning challenges. Data were collected on 60 university students who were attending a Masters' degree program in Psychology during Sept/Oct 2020. Their online university learning experiences was examined through an open-ended format question ("Would you please tell us your experience of being a university student during COVID-19 forced online education? Take your time and write down what happened and how you experienced it. There are no limits of time and space for your narrative"). Students produced written accounts of how COVID-19 forced online education had impacted their ways of being university students. Inductive thematic analysis generated different emergent themes around the cognitive/metacognitive (e.g., cognitive processing and metacognitive regulatory strategies), affective/motivational (e.g., affective reactions, self-efficacy, and personal motivation), and relational/social (e.g., student-teacher and student-colleagues' interactions and communication) dimensions of learning. This research is in progress. The results of this work-in-progress study will be presented at the conference.

Metacognition During Visualization and Metavisualization Practice: Constructs and Instruments

Keywords: Assessment Methods and Tools, Comprehension of Text and Graphics, Metacognition, Survey Research

Presenting Author: Hsin-Yi Chang, National Taiwan Normal University, Taiwan; **Co-Author:** Theerapong Binali, National Taiwan University of Science and

Technology, Taiwan; **Co-Author:**Yen-Jung Chang, National Taiwan Normal University, Taiwan; **Co-Author:**Yun-Syuan He, National Taiwan Normal University, Taiwan; **Co-Author:**Ching-Hwa Chang, National Taiwan Normal University, Taiwan; **Co-Author:**An-Yu Wu, National Taiwan Normal University, Taiwan

We developed two instruments, one measuring individuals' self-report metacognition during visualization and the other measuring individuals' self-report metavisualization practice. Valid data from 212 undergraduate students were analyzed. An exploratory factor analysis (EFA) was conducted using maximum likelihood (ML) as the extraction method with Varimax rotation. The results indicate that the validity and reliability of the instruments are established. Given that visual images and visualizations are ubiquitous and available for student learning nowadays, the instruments developed provide tools for future research such as quantitative evidence or data triangulation to advance understanding of the role of metavisualization in learning with visualization. Advantages and limitations of these two self-report instruments will also be discussed.

A Study of Homophily in Peer Group Members' Academic Motivation

Keywords: Educational Psychology, Motivation, Peer Interaction, Secondary Education

Presenting Author:Izzet Utku Caybas, Middle East Technical University, Turkey; **Co-Author:**Nur Akkus Cakir, Middle East Technical University, Turkey; **Co-Author:**Yesim Capa Aydin, Middle East Technical University, Turkey

Students' motivation is highly influenced by social interactions. One of the most important social interactions at school is the relationships of students with their peers. Therefore, this study explores whether there is homophily among peer group members in terms of their motivation in two middle schools in a large city in Turkey. Motivation was examined through expectancy-related beliefs, intrinsic value, and utility value within the framework of the Situated Expectancy-Value Theory. The Socio-Cognitive Mapping method was used to identify peer groups based on their interaction profiles. According to the study results, there is homophily among peer group members in terms of academic motivation. However, when the groups were analyzed by gender, the girl groups were found to be more homogeneous than boy groups in terms of intrinsic and utility value. In boys groups, there is no homophily in terms of utility value.

Elucidating the Research on Achievement Goals and Academic Dishonesty: A Meta-Analysis

Keywords: Educational Psychology, Goal Orientation, Meta-analysis, Motivation

Presenting Author:Tanja Fritz, University of Augsburg, Germany; **Co-Author:**Anne Petersen, University of Mannheim, Germany; **Co-Author:**Stefan Janke, University of Mannheim, Germany; **Co-Author:**Martin Daumiller, University of Augsburg, Germany

Academic dishonesty is a prevalent phenomenon among students that undermines the fairness and effectiveness of educational institutions. To better understand why some students cheat and others do not, researchers have used an achievement goal approach in the past. Following this approach, researchers distinguish between learning goals, characterized by a focus on skill improvement, and performance goals, characterized by a focus on skill demonstration. Theoretically and empirically, learning goals have consistently been associated with less academic dishonesty—opposed to that, however, it is not clear how performance goals relate to academic dishonesty, as both positive and negative effects, or no associations at all, have been reported in empirical studies on this topic (Daumiller & Janke, 2019, 2020). To elucidate the linkages between goals and academic dishonesty, we meta-analyze the existing literature on this line of research and consider moderators with a specific focus on primary study features, such as the operationalization of constructs (e.g., whether personal or classroom goals are considered), the composition of the sample (e.g., secondary school versus university students), and study designs (e.g., observing actual behaviour versus self-report measures). Taken together, this study contributes insights on open questions within achievement goal research, elucidates fruitful avenues for studying and preventing academic dishonesty in educational institutions and gives practical implications on how motivational aspects of students can be considered to create effective and fair learning environments.

Relating Teachers' Coping Styles to Student Noise and Perceived Stress

Keywords: Attitudes and Beliefs, Emotion and Affect, In-service Teacher Education, Survey Research

Presenting Author:Raphaela Fenzl, University of Passau, Germany; **Co-Author:**Detlef Urhahne, University of Passau, Germany

School noise is a serious and inevitable problem that teachers experience as stress or strain. Coping styles might moderate this stress experience. On the basis of the stress-strain and the transactional stress model, this online study examined how 99 teachers with different coping styles reacted to school noise. The healthy type, the unambitious type, type A and type burnout differed in terms of threat appraisal, noise stress, voice and hearing problems as well as noise-related burnout. Compared to the healthy type, types A and burnout showed higher levels of stress. Teachers of the risk types might be more vulnerable to school noise than teachers of the healthy type. Specific prevention programs might help to improve teacher resilience.

Session Z 2

27 August 2021 15:45 - 16:45

Session Room 10

Poster Presentation

Educational Policy and Systems, Higher Education, Motivational, Social and Affective Processes

Educational Policy and School Effectiveness

Keywords: Achievement, Attitudes and Beliefs, Design-based Research, Developmental Processes, Educational Policy, Educational Psychology, Higher Education, Informal Learning, Motivation and Emotion, Quantitative Methods, School Effectiveness, Secondary Data Analysis, Self-regulation, Social Aspects of Learning and Teaching, Teacher Effectiveness

Interest group: SIG 04 - Higher Education, SIG 14 - Learning and Professional Development, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Ali Yildirim, University of Gothenburg, Sweden

School climate and educational reform - The relationship factor

Keywords: Educational Policy, School Effectiveness, Secondary Data Analysis, Social Aspects of Learning and Teaching

Presenting Author:Orly Shapira, The Hebrew University of Jerusalem, Israel; **Co-Author:**Benzi Slakmon, Tel Aviv University, Israel

In this study we address the dominance of the relationship factor in matters related to school climate and educational change. By reviewing the literature on the topic, we trace the development of school climate research and point to the different aspects emphasized in the field, dating from the 19th through the 21st centuries. We draw on research depicting the implementation of school reform, and discuss the interaction between climate dimensions and educational change. We argue that the relationship factor plays a pivotal role in these areas, rising above all other factors in the educational process, essentially shaping them, and allowing for their development.

"I'll be There": Improving Online Class Attendance With a Commitment Nudge During COVID-19

Keywords: Educational Policy, Educational Psychology, Higher Education, Self-regulation

Presenting Author:Robert Weijers, Erasmus University Rotterdam, Netherlands; **Co-Author:**Lesya Ganushchak, Erasmus University Rotterdam, Netherlands; **Co-Author:**Kim Ouwehand, Erasmus University Rotterdam, Netherlands; **Co-Author:**Björn de Koning, Erasmus University Rotterdam, Netherlands

Class attendance is an important predictor of academic success for higher education students, but students often encounter behavioral barriers that prevent them from attending. Nudging is a technique used in the field of behavioral economics to overcome behavioral barriers. In this experimental study, we applied nudging to the field of education to foster class attendance. Specifically, we investigated the effectiveness of a commitment nudge, namely asking students per email to commit to attending all classes, to improve online attendance among university students ($n = 973$) in a five-week Psychology/Pedagogy course during the COVID-19 pandemic. We compared attendance of students who were asked to commit to attending all classes (experimental condition) with the attendance of students who did not get the commitment nudge (control condition). In the experimental condition, we distinguished between those who committed and those who did not respond. No effect of the nudge was found when comparing the experimental condition (overall) to the control condition. However, students who committed to attending were more often present than those who did not respond and those in the control condition. Exploratory analyses of class attendance in

a previous course revealed that this effect is likely due to a selection bias, where students who are more likely to attend are also more likely to commit. Additionally, the nudge seemed to have a negative effect on attendance for those who did not commit. Future research should focus on different nudge strategies to improve online attendance.

Beliefs and Behaviours: A longitudinal study of leadership networks and self-efficacy

Keywords: Attitudes and Beliefs, Developmental Processes, Educational Policy, Informal Learning

Presenting Author:Jasperina Brouwer, University of Groningen, Netherlands; **Co-Author:**Yi-Hwa Liou, National Taipei University of Education, Taiwan; **Co-Author:**Alan Daly, University of California, United States

This study addresses social processes through which educational leaders implement a major reform around the Common Core State Standards (CCSS). The CCSS are standards related to the academic expectations of students at each grade level. From a social network perspective, we investigate selection mechanisms and the impact of personal self-efficacy beliefs about CCSS on advice seeking among educational leaders on a yearly basis from 2012 to 2016. Longitudinal social network data capture the social dynamics of a districtwide leadership team in one school district in southern California. Findings suggest dynamic structural social processes of tie formation with a slight increase in mutual ties and a stable percentage of transitive ties (i.e., two school district leaders have a shared connection with a third one) over time regarding advice seeking of school district leaders. When school district leaders have a high self-efficacy, it is more likely that they are approached for advice initially, but over time they become more active themselves in approaching others for advice. A tendency toward advice seeking also exists when school district leaders have already a personal relationship with other school district leaders. This study sheds new light on how school district leaders select each other for advice seeking when implementing reform and contributes to the convention theme highlighting the development of learning and instruction.

Using student achievement data for decision making to improve school effectiveness

Keywords: Achievement, School Effectiveness, Secondary Data Analysis, Teacher Effectiveness

Presenting Author:Girts Burgmanis, University of Latvia, The Interdisciplinary Centre for Educational Innovation, Latvia; **Co-Author:**Dace Namsone, University of Latvia, Latvia; **Co-Author:**Pavels Pestovs, University of Latvia, The Interdisciplinary Centre for Educational Innovation, Latvia; **Co-Author:**Ilze Saleniece, University of Latvia, Interdisciplinary Centre for Educational Innovation, Latvia

Data-driven decision making (DDDM) has become increasingly important to improve teaching and learning. Pressure from policymakers on educators to use data to monitor goals and implement evidence based interventions in last decade significantly increased. However, educators are mostly underprepared to effectively use student achievement data for classroom and school improvement. We herein examine our conceptual model for student achievement data analysis to provide feedback to educators. The 11 cases of schools were used to test a conceptual model from two year long study in Liepāja, Latvia. Data base for our model validation were developed using data from national level tests provided by National Centre for Education. Result of validation of our conceptual model for student achievement data analysis was report for school leaders with specified goals and recommendations, how to improve leadership and instruction practices in school. Our study show several findings (1) process of feedback generation using analysis of student achievement data to improve school effectiveness can be algorithmized, (2) prioritization of decisions can be made based on comparison between school's student mean performance score and state's mean score, (3) transformations of numbers in simple qualitative descriptions facilitate understanding of reports.

How to get teachers excited about all-day school. Leadership's influence on teachers' enthusiasm

Keywords: Developmental Processes, Motivation and Emotion, Quantitative Methods, School Effectiveness

Presenting Author:Karsten Wutschka, Center for Research on Education and School Development, TU Dortmund University, Germany; **Co-Author:**Lisa Brücher, Center for Research on Education and School Development, TU Dortmund University, Germany; **Co-Author:**Karin Lossen, Center for Research on Education and School Development, TU Dortmund University, Germany; **Co-Author:**Heinz Günter Holtappels, Center for Research on Education and School Development, TU Dortmund University, Germany

In response to the sobering results in international comparative studies, the expansion of all-day schools is one of the biggest developments in the German school system in recent decades (cf. Holtappels, 2015). In addition to the positive effects pursued with this development, there are numerous innovations for teachers. This results in an increasing focus on teachers' personality traits and attitudes in many empirical studies. Besides commitment or motivation, teachers' enthusiasm is a construct that is considered to have positive effects on students' motivation (cf. Lazarides, Buchholz & Rubach, 2018). Based on these findings the assumption is derived that teachers who show a high level of enthusiasm for all-day schooling manage to get students excited about all-day schooling as well. It is known from subject-specific discourse that teachers initially react skeptically to innovations. Therefore, this paper will be investigating the influence of principals' leadership, teachers' involvement in and general satisfaction with the all-day program, the satisfaction with the sub-aspects of programs' organization and implementation, as well as cooperation with the pedagogical staff on teachers' enthusiasm. This is tested with data of 336 teachers from 60 schools, collected in the course of the second project phase of the study on the development of all-day schools (2012-2015).

Insights from Field Testing of School Leadership Framework

Keywords: Achievement, Design-based Research, Educational Policy, School Effectiveness

Presenting Author:Ilze Saleniece, University of Latvia, Interdisciplinary Centre for Educational Innovation, Latvia; **Co-Author:**Dace Namsone, University of Latvia, Latvia

The research aims at gaining contextually sensitive insights into the use of school leadership framework by testing it as a part of school improvement model. School improvement model developed by authors focuses on evidence based approach to reform implementation in general education by collecting and analyzing data on various factors affecting student achievement, and making data-driven recommendations for improvement solutions. The design based research methodology has been applied through multiple design-test-revise cycles and an active collaboration between researchers and practitioners from 11 schools in a selected municipality. As a result, authors have arrived at conclusions that it is of high importance to look at school leadership practices in the context and relation to other domains, such as teacher performance, student achievement, and contextual factors, thus ensuring corroboration among different data sets, and designing a practice-proof framework. Frameworks that does not provide with an in-depth information about the links among various domains primarily serve as a departure point for general understanding. The purpose of this research is to develop an applicable school leadership framework, that can contribute to the school improvement process in the real-world setting.

Session Z 3

27 August 2021 15:45 - 16:45

Session Room 18

Poster Presentation

Assessment and Evaluation, Higher Education, Learning and Instructional Technology, Learning and Special Education, Motivational, Social and Affective Processes

Qualitative Methods

Keywords: Assessment Methods and Tools, Case Studies, Citizenship Education, Collaborative Learning, Content Analysis, Culture, Early Childhood Education, Educational Technology, Game-based Learning, Higher Education, Mathematics, Qualitative Methods, Secondary Education, Special Education, Teacher Effectiveness, Teaching/Instruction, Video Analysis

Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 08 - Motivation and Emotion, SIG 15 - Special Educational Needs, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Kate Xu, Open University of the Netherlands, Netherlands

Training Teamwork Skills Online: Possibilities of a Multi-player Serious Game

Keywords: Collaborative Learning, Educational Technology, Game-based Learning, Qualitative Methods

Presenting Author:Lara van Peppen, Erasmus University Medical Center, Netherlands; **Co-Author:**Tjitske Faber, Erasmus University Medical Center, Netherlands; **Co-Author:**Vicki Erasmus, Erasmus University Medical Center, Netherlands; **Co-Author:**Mary Dankbaar, Erasmus MC, Netherlands

Fostering students' teamwork skills is an important educational objective in various domains, such as the medical domain. As classes are nowadays more frequent online, it is important to gain insight into the usefulness of online learning environments for developing and refining skills in which interaction plays a major role. It has been suggested that multi-player serious games are promising for team-building and collaboration. However, despite its potential, research in this field is still sparse. The present study, therefore, examined whether a multi-player teamwork focused serious game can provoke the use of teamwork principles. 87 students of a Dutch Medical University (MSc level) played the serious game in groups of four. They had to complete unique actions and communicate effectively with their team using chat functions. Results of the qualitative game log analyses illuminate that students used general communication techniques most often. More specific communication techniques could also be observed in the group communication, both in team chat and one-on-one. Management techniques, however, were less used and situational awareness and decision-making aspects were hardly observed. This may reflect a lack of skills in the student groups, but it is also possible that the setting does not encourage the use of these principles. An additional study with experts (data are collected in March 2021) aims to find this out. These findings offer important insights into how and when a multiplayer serious game can be implemented into curricula for developing skills in which interaction plays a major role. The implications of these findings and directions for future research will be discussed.

What Makes Educational Development Initiatives Successful? – a case study

Keywords: Case Studies, Culture, Higher Education, Qualitative Methods

Presenting Author:Klara Bolander Laksov, Stockholm University, Sweden

University teachers who are funded to engage in educational development projects have been found to become increasingly interested in higher education research and frequently engage in scholarship of teaching and learning. However, research also points to obstacles such as departmental culture and lack of support from management, unhelpful administrative processes and a lack of expertise in higher education research and change. In this study, I interviewed university teachers (n=12) who are funded by an educational development grant scheme, and their heads of departments (n=12), to explore how educational culture interacts with funded educational development initiatives. The results show how the success of projects is impacted by educational culture, ways of working with engagement of peers, ways to create legitimacy for educational development.

An Empirical Comparison of Methods for Observing Motivationally Supportive STEM Teaching Practices

Keywords: Higher Education, Qualitative Methods, Teaching/Instruction, Video Analysis

Presenting Author:Sanheeta Potola, McGill University, Canada; **Presenting Author:**Qiyuan Zheng, McGill University, Canada; **Co-Author:**So Yeon Lee, McGill University, Canada; **Co-Author:**Solomon Friedman, McGill University, Canada; **Co-Author:**Ella Christiaans, McGill University, Canada; **Co-Author:**Kira Rudakova, McGill University, Russian Federation; **Co-Author:**Harshadada Deshpande, McGill University, Canada; **Co-Author:**Phoenix Horrocks, McGill University, Canada; **Co-Author:**Sun jung Choi, McGill University, Canada; **Co-Author:**Kristy Robinson, Michigan State University, United States

Students' value for academic tasks can shift in response to how they are taught, and teachers use a variety of strategies to motivate their students. To measure these strategies and their effects, motivation researchers have created several observational coding schemes from a variety of theoretical perspectives. However, there is a lack of empirical data and consensus about best practices for observing instructors' motivational supports. As a result, there is also a lack of concrete, theoretically-aligned, and cohesive evidence about how instructors can best motivate students. To address these needs, this study empirically evaluated and compared four coding schemes to quantify and describe motivationally supportive teaching, specifically supports for task value, in postsecondary science classrooms. Video lecture recordings obtained from three different instructors of undergraduate chemistry classes were coded for autonomy support (Cheon et al., 2010), relevance statements (Schmidt et al., 2019), and multitheoretical design principles for supporting task value (Robinson, 2019; Turner et al., 2014). The coding schemes were compared using interrater reliability estimates and comparisons of observational mean scores to student perceptions of motivational climate obtained from surveys. Results indicated that even with minimal coder training, observational measures of relevance (i.e., connections to real life, support for meaningfulness, relevance statements) and enthusiasm achieved acceptable reliability in capturing motivational teaching that also appeared to align with student perceptions. For other observational measures, results indicated a need for further development including clearer operational definitions and perhaps more extensive training for coders.

A preschool for all children? Applying a self-reflection tool for improving inclusion

Keywords: Content Analysis, Early Childhood Education, Qualitative Methods, Special Education

Presenting Author:Hanna Ginner Hau, Stockholm University, Sweden; **Co-Author:**Heidi Selenius, Stockholm University, Sweden; **Co-Author:**Eva Björck Åkesson, Jönköping University, Sweden

Building on the Salamanca Statement from 1994, the United Nations Sustainability Development Goals 2030 embraces inclusion for children in early childhood education. The European Agency for Special Needs and Inclusive Education in 2015–2017 completed a project on inclusive early childhood education, focusing on structures, processes, and outcomes that ensure a systemic approach to high-quality Inclusive Early Childhood Education (IECE). An ecosystem model of IECE was developed with a self-reflection tool for improving inclusion. This study's aim was to investigate practitioners' perspective on the inclusive processes and supportive structures defined in the ecosystem model, to contribute to a deeper understanding of how inclusive practice might be enabled and how barriers for inclusion can be removed. The self-reflection tool was administered in a heterogeneous municipality in Sweden, where inclusive settings are standard. Documentation from approximately 70 teachers on 27 teams was received. The documentation was analysed with qualitative content analysis based on the ecosystem model. The results showed a strong emphasis on group-related processes, whereas data on individual-related processes were scarce. This one-sided focus on the group level might endanger the inclusive processes and outcomes concerning the individual child.

Identification item properties related to the instructional sensitivity of mathematics test items

Keywords: Mathematics, Qualitative Methods, Secondary Education, Teacher Effectiveness

Presenting Author:Stephanie Musow, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Jan Hochweber, St. Gallen University of Teacher Education, Switzerland; **Co-Author:**Stephan Schönenberger, University of Teacher Education Thurgau, Switzerland; **Co-Author:**Marit K. List, German Institute for International Educational Research / DIPF, Germany; **Co-Author:**Johannes Hartig, German Institute for International Educational Research (DIPF), Germany; **Co-Author:**Alexander Naumann, DIPF | Leibniz Institute for Research and Information in Education, Germany

Instructional sensitivity relates to the extent to which a test or a single item reflect effects of classroom instruction (Polikoff, 2010). Substantiating instructional sensitivity is important when test scores are used for evaluating teaching effectiveness, because a lack of instructional sensitivity may lead to wrong inferences about the impact of teaching (Popham et al., 2014). The currently established procedures for evaluating instructional sensitivity of test items are expensive and time-consuming, because the evaluation of instructional sensitivity is based on the students' test data (Polikoff, 2010). The identification of item properties that determine instructional sensitivity would be a great benefit because it would allow for a more targeted construction process. Accordingly, the aim of this contribution is to identify item properties that are related to the instructional sensitivity of mathematics test items. We address three questions: To what extent can empirical relationships be found between (1) the change of representation formats, (2) the type of mathematical knowledge, and (3) the response format, respectively, and statistical indicators of items' instructional sensitivity? We use data from a pilot study conducted in Switzerland. Data collection is based on a pretest-posttest design and will be finished in February 2021. The sample will comprise 140 students from seven eighth-grade classrooms. In order to identify item properties that are related to instructional sensitivity, analyses of the change in item difficulty in consideration of item properties will be provided. The findings from this study will provide insights to support an effective item construction process.

Exploring students' perceptions on citizenship education in authentic learning environments

Keywords: Assessment Methods and Tools, Citizenship Education, Higher Education, Qualitative Methods

Presenting Author:Renske de Leeuw, Saxion University of Applied Sciences, Netherlands; **Co-Author:**Annemarijn Walberg, Saxion University of Applied Sciences, Netherlands; **Co-Author:**Willeke Slingerland, Saxion University of Applied Sciences, Netherlands; **Co-Author:**Detlef Wagenaar, Saxion University of

Applied Sciences, Netherlands

This contribution aims to contribute to the existing body of knowledge of citizenship education based on the experiences and perceptions of students at a University of Applied Sciences. A mix of multiple qualitative research methods was selected to capture these experiences and perceptions. In the contribution, the results of a pilot study with three multidisciplinary groups of fourth-year students are presented. The findings indicate that students perceive the activities of the pilot study as highly valuable and contributing to citizenship education in authentic learning environments. Notwithstanding students shared that clients and tutors unintentionally hinder the development of their citizenship skills, in the authentic learning environments.

Session Z 4

27 August 2021 15:45 - 16:45

Session Room 3

Poster Presentation

Culture, Morality, Religion and Education, Developmental Aspects of Instruction, Educational Policy and Systems, Higher Education, Lifelong Learning

Social Sciences

Keywords: At-risk Students, Citizenship Education, Conceptual Change, Content Analysis, Culture, Doctoral Education, Educational Policy, Ethnography, Literacy, Misconceptions, Philosophy, Primary Education, Quantitative Methods, Religious Studies, Social Sciences, Survey Research

Interest group: SIG 03 - Conceptual Change, SIG 13 - Moral and Democratic Education, SIG 19 - Religions and Worldviews in Education, SIG 21 - Learning and Teaching in Culturally Diverse Settings, SIG 24 - Researcher Education and Careers

Chairperson: Tessa de Leur, Amsterdam University of Applied Sciences (AUAS), Netherlands

Interest in doctoral studies in relation to experiences of burnout and drop-out intentions

Keywords: At-risk Students, Doctoral Education, Quantitative Methods, Social Sciences

Presenting Author: Solveig Cornér, University of Helsinki, Finland; **Co-Author:** Kirsi Pyhältö, University of Helsinki, Finland; **Co-Author:** Jouni Peltonen, University of Oulu, Finland; **Co-Author:** Erika Löfström, University of Helsinki, Finland

Abstract This study focused on exploring individual variation in doctoral students' interest in doctoral studies and how the interest was related to experiences of burnout and drop-out intentions among Finnish and Danish doctoral students. A total of 365 doctoral students in social science and humanities disciplines in Finland and Denmark answered a *Cross-Cultural Doctoral Experience Survey* (Pyhältö, Stubb, & Lonka, 2009; Pyhältö, Vekkaila, & Keskinen 2015). Four different student profiles of interest in doctoral studies were identified: *High interest profile*, *Moderate interest profile*, *Developmental, research and impact interest profile* and *Development and impact interest profile*. *Development and impact interest profile* and *Moderate interest profile* holders had higher risk for entertaining dropping-out intentions compared to other profiles. Individuals in the *Moderate interest profile* showed the highest level of burnout symptoms. Our results imply that the personal interest was not determined by the socio-cultural differences between the countries. However, personal interest plays a central role in preventing study burnout and drop-out intentions. **Keywords:** doctoral students, cross-country comparison, interest, student profiles, burnout, drop-out intentions

Education and spirituality in a project for the reintegration of convicts

Keywords: Ethnography, Philosophy, Religious Studies, Social Sciences

Presenting Author: Sergio Grossi, University of Padova, Italy, Italy

Prison legitimization also results from its educational effect on inmates, although several studies have highlighted that social reintegration programmes often act as mere bureaucratic marketing. Education for social reintegration must be critically reconsidered. Created in Brazil in 1972 by a group of Christian volunteers, the educational proposal of the Social Reintegration Centres (SRC) has expanded globally and now it covers more than 3,000 inmates, promising to include convicted persons and reduce recidivism. This study analysed the educational proposals of SRC, highlighting the differences and continuity in comparison to traditional prisons. Then, it analysed the implementation of practices through a review of Brazilian studies on this experience and a brief ethnography about two model units, which took 40 days of participant observation and open and semi-structured interviews with the inmates, officers, volunteers and judges. The study highlighted a different vision of social reintegration, considering prison as an educational community. Education has also an effect on society, reducing the stigma and distance between people inside and outside the prison. Christian spirituality leads society to think that no person is irrecoverable, regardless of the type of crime, and trust convicted people. Then, this study emphasises the importance of inserting the debate about prison back into the sciences of education and reflection about spirituality, seeking to propose practices that respect international laws and promote the social inclusion of offenders. Further studies assessing model experiences that can lead to the development of new interventions are required, establishing a strong connection between practice and reflection.

Changes in reading habits during the COVID-19 confinement in Spain

Keywords: Culture, Literacy, Social Sciences, Survey Research

Presenting Author: Pablo Delgado, University of Valencia, Spain; **Co-Author:** María-Angeles Serrano, University of Valencia, Spain; **Co-Author:** Nadina Gómez-Merino, University of Valencia / Interdisciplinary Research Structure for Reading Research (ERI Lectura), Spain; **Co-Author:** Marina Pi-Ruano, University of Valencia, Spain; **Co-Author:** Alba Rubio, University of Valencia / Interdisciplinary Research Structure for Reading Research (ERI Lectura), Spain; **Co-Author:** Noemí Skrobiszewska, University of Valencia, Spain; **Co-Author:** Ladislao Salmerón, University of Valencia, Spain

As in many countries, the Spanish population stayed confined at their homes due to the coronavirus pandemic. This study explored the changes in their reading habits over the first four weeks of the 2-month confinement, and how they varied across population's gender, age, and audio-visual consumption, and type of reading (study/work, leisure, news, and social reading). We surveyed 4,181 adults using an online questionnaire that took three moments as reference: before, beginning of confinement, and mid-confinement. We found that the Spanish citizens increased their reading time during the first two weeks (beginning) of the confinement, as compared to previous occasions in which they stayed several days off at home (before). This increase remained stable during the third and fourth week of confinement (mid-confinement). By type of reading, main changes showed that, in younger population, leisure reading increased throughout the two reference moments of the confinement, but news reading decreased as the confinement went on, as compared to the first two weeks. Besides, those who consumed audio-visuals more often were found to read also more. Finally, in line with previous findings on gender differences in reading habits, women read more than men and increased their reading time to a greater extent. We conclude that educational policies should take into account the promotion of reading habits as a way to foster population's well-being.

Young professionals' conceptions of the tax system in Germany: An interview study

Keywords: Citizenship Education, Conceptual Change, Misconceptions, Social Sciences

Presenting Author: Carmela Aprea, University of Mannheim, Germany

The study presented in this paper aims at exploring how young professionals conceive the tax system in Germany. It particularly addresses the following research question: (1) What conceptions do young professionals have about the tax system in Germany and how elaborated are these in terms of scope, correctness and differentiation? (2) How fair do young professionals consider the tax system in Germany, and which aspects of fairness come into play in their argumentation? (3) How do young professionals estimate their own tax competence, and how do they view their role as taxpayer? To answer these questions, an interview study with 24 young professionals from four different occupational profiles (salespersons, office clerks, car mechanics and hairdressers) was conducted, and data were analysed by means of thematic and content analyses. Results from these analyses reveal that young professionals' associations with taxes are rather negative and often filled with fear. In addition, their conceptions of the tax system are very similar to those of laypersons in other areas of economics. This is particularly evident in the fact that they frequently mix their reasoning with moral and often one-sidedly exaggerated judgments. They also tend to ignore indirect effects, as can be seen from their tendency to highlight the fiscal function of taxation and to disregard the (less obvious) redistributive one.

A prominent misconception of young professionals is that they generally equate taxes with social security contributions. Most of them mistakenly think that unemployment benefits or pensions are also paid from tax revenues.

Citizenship Education in the French Canadian Social Studies Programs

Keywords: Citizenship Education, Content Analysis, Primary Education, Social Sciences

Presenting Author: Daniel Moreau, Université de Sherbrooke, Canada; **Co-Author:** Joyce Anna Ottereyes, Université de Sherbrooke, Canada; **Co-Author:** Zoé Chamberland Black, Université de Sherbrooke, Canada; **Co-Author:** Francois Larose, Université de Sherbrooke, Canada; **Co-Author:** Jonathan Smith, Université de Sherbrooke, Canada

This presentation outlines the results of a content analysis applied to all Francophone Canadian primary school social sciences and humanities (SSH) programs. These programs are said to be aimed at contributing to citizenship education, yet they have also been found to be based on somewhat vague or equivocal guidelines (Hugues & Sears, 2006). To measure this phenomenon, a lexicometrical content analysis was carried out on corpora made up of all the learning content contained in the curricula of these programs. What knowledge is associated with citizenship education in Canada? Is there common knowledge that expresses a common representation of this construct? Conversely, are there *regional* and *cultural* differences and disparities between provinces and territories? The lexicometrical analysis of the corpus made it possible to answer these questions by identifying structural characteristics, represented in the form of factorial designs. The data was interpreted using Westheimer and Kahne's (2004) model of citizenship education, and indeed reveals regional and cultural particularities in citizenship education across Canada.

Education, prison and the intercultural challenge: what is to be done?

Keywords: Educational Policy, Ethnography, Philosophy, Social Sciences

Presenting Author: Sergio Grossi, University of Padova, Italy, Italy

Prison in Europe is becoming an increasingly multicultural environment due to the significant presence of migrants in the continent. Education aimed at the reintegration of convicted persons is one of the objectives of the sentence, according to international law. Often, however, it is not effective and is described as bureaucratic marketing by research in the sociological and criminological area. Pedagogy has elaborated several theoretical proposals to rethink education for convicts and, at the same time, several studies have emerged analysing concrete model proposals that have been implemented on projects for the social reintegration of convicts. In particular, two model experiences in Italy and Norway will be analysed and compared with experiences already analysed in Spain, Brazil, Uruguay, and Argentina. Discourses describing the two experiences will be analysed through their self-presentation. In order to analyse the practices in the model units, a two-month ethnography will be carried out which includes the writing of a field diary, as well as forty open-ended and semi-structured interviews with staff and convicts. Data obtained in these analyses will be used to compare different experiences and will allow us to evaluate the current situation in terms of best practices in education and reintegration aimed at the social inclusion of people who are convicted. This study thus fills a gap in education and prison sociology by connecting these disciplines. The knowledge acquired in this study will promote the development of new research that will contribute to the establishment of this interdisciplinary field of study.

Session Z 5

27 August 2021 15:45 - 16:45

Session Room 1

Poster Presentation

Teaching and Teacher Education

Teaching and Teacher Education

Keywords: Content Analysis, Design-based Research, Educational Psychology, Environmental Education, Higher Education, History, Literacy, Primary Education, Quantitative Methods, Secondary Education, Teacher Effectiveness, Teacher Professional Development, Teaching/Instruction, Vocational Education, Writing/Literacy

Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development

Chairperson: Nina Bonderup Dohn, University of Southern Denmark, Denmark

How to trigger historical reasoning in elementary school students? Creating a teacher PD-programme

Keywords: Design-based Research, History, Primary Education, Teacher Professional Development

Presenting Author: Yolande Potjer, University of Amsterdam, Netherlands

History education researchers emphasize the importance of historical reasoning activities in teaching and learning history (Levstik & Barton, 2008; 2015; Levstik & Thornton, 2018; Van Boxtel, et.al., 2020). Historical reasoning activities, such as thinking about cause and consequence, differences and similarities or continuity and change, aim to develop students' ability to evaluate and formulate interpretations of the past by analysing and interpreting historical sources (Van Boxtel et al., 2020). Historical reasoning skills can also be applied to contemporary problems (Levstik & Barton, 2015). Historical reasoning is not part of the current elementary school history curriculum in the Netherlands, but is important in light of continuing learning from elementary to secondary school. To prepare teachers for this task, we developed a professional development (PD-)programme to prepare teachers in grade 3-6 to enhance historical reasoning. We performed a pilot study of this PD-programme with four teachers teaching grade 3 to 6. The central research question of this study is: What are characteristics of a PD-programme in which elementary school teachers learn to reason historically and develop skills to design inquiry-based historical reasoning lessons? We present the description and results of the pilot PD-programme and the resulting set of twelve design principles used to design a two-year intervention, called the History workplace. Over the course of three meetings, we saw beginning change in the personal domain for all participants. One participant tried out a historical reasoning activity in her class and indicates some change in the domain of consequence.

Challenges in the Recruitment of Student Teachers for Vocational Education in Germany

Keywords: Higher Education, Quantitative Methods, Teacher Professional Development, Vocational Education

Presenting Author: Lars Müller, JLU Gießen, Germany

In Germany, not enough students for vocational school teaching can be found. The teaching position for vocational schools has a rather bad image and is less known to the prospective students. In addition, they have to combine technical and social skills, a comparatively rare profile. In order to counteract the shortage of skilled workers, however, vocational school teachers play an important role. The article proposes that people who study engineering but also have a socially-oriented personality (according to RIASEC) can also be won over to the vocational school teaching position. Therefore, it is empirically investigated (DZHW panel of high school leavers) to what extent these social engineers differ from other engineers and actual teacher training students with regard to their professional motives (Expectancy Value Theory). It turns out that social engineers have high ambitions in several regards. They are advancement-oriented and strive for good income and security. At the same time, they want to make a contribution to society. Aptitude tests and information on studying must emphasize these aspects in order to attract more vocational school teachers in the future.

Sustainability in the context of Responsible Research and Innovation as perceived by teachers

Keywords: Content Analysis, Environmental Education, Primary Education, Secondary Education

Presenting Author: Mirjam Burget, University of Tartu, Estonia

Responsible Research and Innovation (RRI) has become a significant part of the European research and innovation policy. RRI is described as a way of cooperation where various stakeholders are democratically involved, anticipating, and discerning how research and innovation can or may benefit society. In previous studies RRI was connected to philosophies in education, however, the recent studies show that to make learning more meaningful for learners there is a need to promote sustainability in connection to RRI. The aim of the present research is to examine the way science teachers perceive sustainability in the context of RRI. The data was gathered by semi-structured interviews with 28 science teachers. The data was analyzed by the abductive content analysis where

the concept of sustainability was considered through the model of RRI in education. Thus, the study concentrated on three dimensions – sense-making, action-taking, and exploring – and relationships between them. The preliminary results showed that sustainability can cover all dimensions of the RRI model in education. The results give an opportunity to complement the RRI model in education and to focus on sustainability as an integral part of RRI.

Teaching in flexible spatial and digital conditions

Keywords: Design-based Research, Literacy, Teacher Professional Development, Writing/Literacy

Presenting Author:Anna Maria Hipkiss, Göteborgs universitet, Sweden; **Co-Author:**Pernilla Andersson Varga, Center for Development, Learning & Research, City of Gothenburg, Sweden; **Co-Author:**Sylvana Sofkova Hashemi, University of Gothenburg; Halmstad University, Sweden; **Co-Author:**Maria Spante, University West, Sweden; **Co-Author:**Martin Tallvid, Center for Development, Learning & Research, City of Gothenburg, Sweden; **Co-Author:**Mats Widigson, Center for Development, Learning & Research, City of Gothenburg, Sweden

This study explores the opportunities and challenges of teaching under flexible spatial and digital conditions of the learning environment of a newly build school, analyzing how teaching is organized and what curricular genres can be discerned, what resources and practices are offered to stimulate students meaning-making and what framing, relations and accessibility can be distinguished by the flexibility of furniture and classroom space. The analyses of a teacher team's planning and teaching of the thematic work project on *Space* in years 2-3 (ages 8 to 9) and another teacher team's thematic work project on *Communication* in years 4-7 (ages 10 to 12) reveal varied teaching strategies between teacher-led and student-centered forms offering students linguistic, visual and audiovisual resources to make meaning of shared content in different school subjects. The young students practice reading comprehension, both of written texts and films, that also serves their knowledge-building about space. The older students display skills relating to different subjects through different technological and digital resources.

Efficacy Messages used by Teachers Prior to High Stakes Examinations

Keywords: Educational Psychology, Secondary Education, Teacher Effectiveness, Teaching/Instruction

Presenting Author:Hannah Wilkinson, Liverpool John Moores University, United Kingdom; **Co-Author:**Dave Putwain, Liverpool John Moores University, United Kingdom; **Co-Author:**Andrea Mallaburn, Liverpool John Moores University, United Kingdom

How students perceive teachers' communications regarding forthcoming exams has significant implications on a variety of educational factors. The Teacher's use of Efficacy Appeals in the Classroom prior to High-Stakes Exams (TEACHE) questionnaire was designed to measure how students perceive communications regarding the practicalities of preparing for forthcoming exams. This study aimed to examine the validity and reliability of the data collected from the TEACHE. Cognitive interviews with 6 Year 11 students, refined and improved the clarity of the questions. Questionnaire data from 236 Year 10 students from two English secondary schools was used to assess the validity and reliability of data obtained from the TEACHE. Confirmatory factor analysis was conducted to examine the factor structure of the TEACHE items. An 18-item version, with 3 factors: Message frequency, Response efficacy, Self-efficacy, each containing 6 items, showed a good fit to the data: RMSEA = .032, SRMR = 0.55, CFI = .972, and TLI = .962. The convergent validity between items the three TEACHE constructs and the theoretically related constructs from the Motivation and Engagement Scale (MES) (Martin, 2010) and Questionnaire on Teacher Interaction (QTI) (Wubbels & Brekelmans, 2005) was established through latent bivariate correlations. These two studies have improved the TEACHE so that it is accessible to students and produces reliable and valid data. Therefore, the TEACHE questionnaire can be used in future research to understand how students appraise teacher's communications about exam preparation.

Session Z 6

27 August 2021 15:45 - 16:45

Session Room 8

Poster Presentation

Higher Education, Instructional Design, Motivational, Social and Affective Processes

Mathematics

Keywords: Achievement, Cognitive Skills, Experimental Studies, Goal Orientation, Higher Education, Instructional Design, Learning and Developmental Difficulties, Mathematics, Motivation, Pre-service Teacher Education, Primary Education, Problem Solving, Secondary Education, Student Learning, Teaching Approaches

Interest group: SIG 03 - Conceptual Change, SIG 04 - Higher Education, SIG 08 - Motivation and Emotion

Chairperson: Jon Star, Harvard University, United States

Testing the effectiveness of a cognitive training designed for academically talented children

Keywords: Cognitive Skills, Instructional Design, Mathematics, Primary Education

Presenting Author:Suzanne Splinter, Katholieke Universiteit Leuven, Belgium; **Co-Author:**Bart Vogelaar, Leiden University, Netherlands

Cognitive training interventions aim to promote cognitive functions (e.g. working memory, metacognition) and academic performances (e.g. arithmetic), and have received increasing attention in research. Yet, little research has been done on cognitive training interventions designed for academically talented children. Even though academically talented children often already perform above average on cognitive tasks, they as well can strengthen their abilities, and consequently should get the opportunity to do so. Therefore, the aim of the current study was to investigate whether a cognitive problem-solving training focused on arithmetic and designed for academically talented children (9-11 years) could support the improvement of auditory and visual working memory, and arithmetical metacognition from pretest to posttest in these children. The study had a pretest-training-posttest design with an experimental and waitlist (control) condition. The training format was based on the intervention designed by Cornoldi and colleagues (2015). Yet, the current training was designed to fit the academic and cognitive level of academically talented children. The training consisted of eight sessions that were aimed at the strengthening of arithmetical metacognition and auditory working memory skills, and the learning of applying a strategy to solve arithmetic word-problems. The results showed that there was no training effect for auditory working memory and no transfer effect to visual working memory. The training did have a significant effect on arithmetical metacognition. On the basis of these results, implications for practice and research are provided.

Differences in Word-Problem Solving Based on Item Characteristics

Keywords: Achievement, Learning and Developmental Difficulties, Mathematics, Problem Solving

Presenting Author:Sarah Powell, University of Texas at Austin, United States; **Co-Author:**Tessa Arsenault, The University of Texas at Austin, United States

Across a 3-year period, we collected word-problem performance data from 474 third-grade students experiencing mathematics difficulty with word problems. To all students, we administered a set of measures related to word-problem solving with a total of 26 different word problems. These measures featured the word-problem schemas of total, difference, and change as well as multi-schema word problems. Some problems featured information in charts or graphs and other problems featured irrelevant information. Within each schema, the position of the unknown varied. In a comparison across the schemas, students demonstrated higher rates of accuracy with total and change problems compared to difference and multi-schema problems. Additionally, students solved problems with an unknown that was not the sum or difference with less accuracy. These results indicate that teachers of students who experience mathematics difficulty should spend more instructional time on difference and multi-schema problems as well as problems in which the unknown is a missing addend, minuend, or subtrahend.

Stability of task values in a university mathematics course

Keywords: Higher Education, Mathematics, Motivation, Student Learning

Presenting Author:Stefanie Rach, Otto-von-Guericke-Universität Magdeburg, Germany; **Co-Author:**Jan Retelsdorf, University of Hamburg, Germany

Subjective task values are widely believed to be important motivational characteristics. Based on situated expectancy-value theory, this article discusses how task values are influenced by embeddedness in context. More concretely, it is not yet clear how consistent value beliefs are over time. On the one hand, value

beliefs in a domain are embedded in a human's personality; on the other hand, the learning context changes from situation to situation. We analyse the stability of task values in a university mathematics course for freshmen. A total of 178 freshmen took part in this study. They completed a questionnaire on their task values at three times during three different lessons. Applying the STARTS (Stable Trait, AutoRegressive Trait, and State) model, we investigate the study aim. The results provide evidence for the general pattern of a major proportion of stable and autoregressive trait variance, and almost no state variance in task values. As there is only a smooth change of task values from one occasion to another, long-term interventions may be more successful than short-term interventions in fostering task values.

Teach what you have been preached? Influencing preservice teachers' views on mathematical content

Keywords: Experimental Studies, Goal Orientation, Mathematics, Pre-service Teacher Education

Presenting Author: Simon Guse, University of Muenster, Germany; **Co-Author:** Dorothe Kienhues, University of Münster, Germany; **Co-Author:** Regina Jucks, WWU Münster, Germany

In their daily life at university, preservice teachers often experience a tension between dealing with scientific content and getting prepared for their future job. Research from science education and teacher education points to the role of *attitudes towards science* for referring to scientific evidence to improve teaching. That is, preservice teachers who value science are not only more motivated for an academic course but also more likely to apply the content learned afterwards in their teaching. Furthermore, students' evaluation of a task can be influenced by the communication of its relevance. Using a 1x2 design with $N=101$ German preservice elementary school teachers the hypothesis was tested that the communicated relevance of a course impacts participants' intrinsic goal orientation, task value, and utility value of the course as well as participants' evaluation of scientific content (open-ended questions). Participants read an introductory text on why a specific content of a (fictitious) mathematics course is relevant. The introductory text either stresses the relevance of the course for studying mathematics at university (scientific context condition) or for teaching mathematics in school (vocational context condition). Results indicate no significant between-group differences regarding intrinsic goal orientation, task value, and utility value. All participants, regardless of condition, mainly refer to relevance for teaching in their answers to the open-ended questions. Reasons for the results and future interventions will be discussed, including the tension between academic and applied perspectives in teacher education.

Reciprocal effects between self-determined motivation and engagement in mathematics instruction

Keywords: Mathematics, Motivation, Secondary Education, Student Learning

Presenting Author: Tanja Held, University of Bern, Switzerland; **Co-Author:** Tina Hascher, University of Bern, Institute of Educational Science, Switzerland

Student motivation and engagement are key requirements for successful learning. Existing research has shown that motivation can be seen as a predictor of engagement. However, this relationship might not be seen as linear, as engagement may also predict motivation for future learning activities. Therefore, the present paper investigates whether reciprocal effect can be found between self-determined motivation and behavioral engagement in mathematics instruction in lower secondary education. A total of six latent cross-lagged structural equation models were conducted with two forms of self-determined motivation (intrinsic and identified regulation) and three behavioral engagement indicators (effort, inattention, and procrastination). Data consists of answers of 348 students in Grades 7 and 8 at three measurement points. Results revealed positive effects between both forms of self-determined motivation and effort, and negative effects between both forms of self-determined motivation and inattention and procrastination over time. Cross-lagged effects vary depending on the behavioral engagement indicators and in terms of the strength of the direction. These results suggest that, in addition to the effect of motivation on behavioral engagement, students' behavioral engagement in learning activities in mathematics may also influence his or her future motivation for mathematics learning.

Improving Instructional Quality by Comparing and Discussing Multiple Strategies

Keywords: Mathematics, Secondary Education, Student Learning, Teaching Approaches

Presenting Author: Jon Star, Harvard University, United States; **Co-Author:** Bethany Rittle-Johnson, Vanderbilt University, United States; **Co-Author:** Kelley Durkin, Vanderbilt University, United States; **Co-Author:** Jessica Sommer, Vanderbilt University, United States

Productive learning of algebra is supported when students reflect on multiple strategies, compare them and discuss the rationale behind and relative merits of particular strategies. *Comparison and Discussion of Multiple Strategies (CDMS)* is an instructional approach designed to support these processes in math classrooms. In the current study, 15 teachers received professional development and supplemental materials to support CDMS when teaching an Algebra I course, with 431 students receiving treatment. Twelve Algebra I teachers and their 289 students were the business-as-usual control group. Students completed assessments of their conceptual knowledge, procedural knowledge, and procedural flexibility, before and after each of four target units as well as before and after the course as a whole. We found that use of CDMS increased how often teachers engaged their students in comparison of multiple strategies, sustained small group work, and sustained mathematical discussions. However, students' performance on the assessments was often not higher in classrooms using CDMS, although it was higher on the unit assessment for linear equations. Thus, CDMS shows promise for improving classroom instructional quality, but has not yet led to robust improvements in student knowledge.

Session Z 7

27 August 2021 15:45 - 16:45

Session Room 16

Poster Presentation

Assessment and Evaluation, Teaching and Teacher Education

Competencies

Keywords: Competencies, Lifelong Learning, Mixed-method Research, Multicultural Education, Pre-service Teacher Education, Quasi-experimental Research, Reflection, Self-efficacy, Self-regulation, Social Interaction, Teacher Professional Development, Teaching Approaches, Technology

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development

Chairperson: Antti Koskinen, University of Tampere, Finland, Finland

Two dimensions of teacher students' digital competence: practical and algorithmic

Keywords: Competencies, Self-efficacy, Teacher Professional Development, Technology

Presenting Author: Milla Kruskopf, University of Helsinki, Finland; **Co-Author:** Heidi Lammassaari, University of Helsinki, Finland; **Co-Author:** Kirsti Lonka, University of Helsinki, Finland

Our global, digitalizing information society requires new kinds of competencies in order to achieve active citizenship and ultimately help build a collectively sustainable, digitalized future. Future teachers are key players in supporting the development of these competencies. We investigated beginning student teachers' ($n = 274$) self-efficacy in supporting 21st century competencies with exploratory factor analyses. Two factors were discovered regarding digital competence: practical (i.e. acquiring and managing data, digitalized everyday life) and algorithmic (i.e. algorithmic thinking, programming and information security). The teacher students' self-efficacy was generally higher in the practical than in the algorithmic competence. Regression analyses and one-way ANOVA's were implemented to study the effects of relevant, significantly correlating background factors on these two dimensions. Males and future natural science teachers had better self-efficacy in both of these competencies. Humanists, however, considered the practical digital competencies more important than the natural scientists. Age predicted negatively the practical digital competence but not the algorithmic competence. These results provide support for the so-called "digital natives" metaphor regarding the practical digital competence but not the more algorithmic competence indicating deeper understanding of the workings of digital technology. The adoption of the latter thus seems to require a more guided, formal learning process than the adoption of humanely very intuitively designed user interfaces. To achieve an active, fully literate citizenship requires an algorithmic-level understanding of the pervasive digital interfaces of our everyday lives and societal action. This is why it is essential to better support teacher students' digital competencies comprehensively, throughout their studies.

The Effect of Mentoring on Knowledge Gain for Beginning Teachers

Keywords: Competencies, Pre-service Teacher Education, Quasi-experimental Research, Reflection

Presenting Author:Eva Anderson-Park, University of Duisburg-Essen, Germany; **Co-Author:**Stephanie Morgenroth, Junior-Uni Wuppertal, Germany; **Co-Author:**Hermann J. Abs, University of Duisburg-Essen, Germany

Research shows that participating in teacher training programs correlates with teacher competence and thus is an important way for transferring job specific knowledge. While most of the existing research focuses on U.S. data, research on alternative teacher training in Europe is still scarce (Abs et al., 2019). Even though teacher mentoring is considered an important factor for professional development in effective teacher training (Darling-Hammond et al., 2018), no comprehensive study exists on the role of mentoring in pedagogical knowledge gain of initial teachers who follow different pathways into teaching. This paper examines whether alternatively trained teachers (intervention group) show an equal knowledge gain in the pedagogical test as traditionally trained teachers (control group) and whether reflection with a mentor has an effect on this gain. Data were measured via online questionnaires over a two year period. For the current analysis, the largest country-samples were used: Austria and Bulgaria. In addition to t-tests, two different regression models analyse the effect of training (1) and mentoring (2). We control for age, gender, grades and pedagogical experience. Furthermore, conditional effects plots were considered. Bivariate t-tests show that participants of the intervention groups possess a higher initial pedagogical knowledge than participants of the control group. In both countries, the knowledge gain is higher for the intervention than for the control group after two years. The second model shows that the perceived opportunities to reflect with a mentor significantly affect knowledge gain after two years. This effect is stronger for the intervention group participants.

Aggression management of pre-service teachers: Competence development via online simulations

Keywords: Competencies, Pre-service Teacher Education, Social Interaction, Teaching Approaches

Presenting Author:Delphine Franco, University of Ghent, Belgium; **Co-Author:**Ruben Vanderlinde, Ghent University, Belgium; **Co-Author:**Martin Valcke, Ghent University, Belgium

Although reacting properly to students' aggressive behaviour in the classroom is considered a key competence (Emmer & Stough, 2001), novice teachers often fail to react properly to students' problem behaviour such as (verbal) aggressive behaviour. Furthermore, they report feeling ill-prepared to deal with problem behaviour (Brouwers & Tomic, 2000). One possible explanation is the lack of authentic learning experiences provided by initial teacher training programs.

Current study investigates if online clinical simulations could have a positive effect on the development of the (verbal) aggression management competence of pre-service teachers. More specifically, we focus on their situation-specific skills (i.e. perception, interpretation and decision-making) which are, according to Blömeke, Gustafsson and Shavelson (2015), central aspects of the competence development continuum.

In total, 135 pre-service teachers enrolled in a one-year university level teacher training program were asked to participate in the intervention (i.e. two online clinical simulations). After coding the answers of the pre-service teachers to calculate their index scores on both the pre- and post-simulation, analysis demonstrates that both the detection and decision-making skills improved significantly. However, no significant effect could be discerned for the interpretation skills. These results suggest that online clinical simulations are indeed a promising approach to foster the (verbal) aggression management competence mastery of pre-service teachers, but attention should be paid, and additional adjustments must be made, to also develop their interpretation skills.

Teacher educators' competence to deal with diversity

Keywords: Competencies, Mixed-method Research, Multicultural Education, Pre-service Teacher Education

Presenting Author:Benjamin Ponet, University of Ghent, Belgium; **Co-Author:**Hanne Tack, Ghent University, Belgium; **Co-Author:**Wendelien Vantieghem, Vrije Universiteit Brussel, Belgium; **Co-Author:**Piet Van Avermaet, Ghent University, Belgium; **Co-Author:**Ruben Vanderlinde, Ghent University, Belgium

This poster presentation provides insight into the design of a recently started PhD project with its main objective to advance fundamental knowledge on teacher educators' competence to deal with diversity. Research on this specific group of educational professionals is limited in general; with particularly scarce knowledge on their competence to deal with diversity. In this respect, the educational literature does cover theoretical and pedagogical frameworks regarding dealing with diversity (e.g., multicultural education, inclusive education, culturally responsive pedagogy). Furthermore, a lot is written about the knowledge, skills and attitudes (i.e. competences) educational professionals need to put these frameworks into practice. However, specific knowledge on these dimensions regarding higher education-based teacher educators is scarce. To tackle these gaps described in educational research, four consecutive studies using different methodologies are proposed. Study 1 conceptualises the different dimensions described in the literature as important to teacher educators' competence to deal with diversity. Study 2 assesses the dimensions of teacher educators' competence to deal with diversity. Study 3 explores the relationship between the dimensions of teacher educators' competence to deal with diversity and teacher educators' characteristics (e.g., personal experiences, institutional context, local context). Study 4 is an intervention-based study assessing the impact of a professional development initiative on the development of the dimensions of teacher educators' competence to deal with diversity. As such, the PhD project pioneers theoretical, empirical and methodological insight in the field of teacher education research.

Enhancing training effectiveness: a methodology to capture dynamic transfer trajectories

Keywords: Competencies, Lifelong Learning, Self-efficacy, Self-regulation

Presenting Author:Tine van Daal, University of Antwerp, Belgium; **Co-Author:**Marije Lesterhuis, University of Antwerp/ Spaarne Gasthuis, Netherlands; **Co-Author:**Piet Van den Bossche, University of Antwerp, Belgium; **Co-Author:**David Gijbels, University of Antwerp, Belgium; **Co-Author:**Sven De Maeyer, Antwerp University, Belgium

Up to now, transfer is mainly operationalized as a "single-shot event" and captured using self-ratings. This is at odds with the consensual definition of transfer as the use, maintenance and generalisation of learned competences to improve performance. Building on the Dynamic Transfer Model that views transfer as a dynamic process initiated during training and unfolding in the workplace, this poster presents a methodological framework that can be used to dynamically map transfer trajectories. This framework contains measurements of performance during training and at the workplace (competence), personal characteristics of the training participant (eg. self efficacy and transfer intention) and work environment factors (manager and peer support). The framework is exemplified using a concrete case.

Session Z 8

27 August 2021 15:45 - 16:45

Session Room 11

Poster Presentation

Motivational, Social and Affective Processes

Emotion and Affect

Keywords: Citizenship Education, Communities of Learners, Conversation/Discourse Analysis, Developmental Processes, E-Learning/Online Learning, Educational Psychology, Emotion and Affect, Language (L1/Standard Language), Motivation and Emotion, Primary Education, Social Aspects of Learning and Teaching, Social Development, Social Interaction, Teaching Approaches

Interest group:SIG 05 - Learning and Development in Early Childhood, SIG 08 - Motivation and Emotion

Chairperson: Maria Wirzberger, Germany

You Make Me Feel (2.0) – Emotions in Contentious Educational Discussions on Digital Settings

Keywords: Citizenship Education, Conversation/Discourse Analysis, E-Learning/Online Learning, Emotion and Affect

Presenting Author:Efrat Firer, The Hebrew University of Jerusalem, Israel; **Presenting Author:**Omer Keynan, The Hebrew University of Jerusalem, Israel; **Co-Author:**Benzi Slakmon, Tel Aviv University, Israel; **Co-Author:**Baruch Schwarz, Hebrew University of Jerusalem, Israel

Understanding emotion manifestation, regulation, expression, and perception in e-media discussions is important for both research and practice. A research plan was developed to explore computer-mediated contentious discussions of undergraduate students, in small groups of different gender, ethnicity and religion. The discussions are planned to involve participants' identities and life experiences, and are expected to yield intense, sometimes contradicting emotions among the discussants, in order to: (1) trace emotion expressions and emotional regulation processes that emerge within the discussions; (2) understand perception of emotions in this context, and; (3) compare the emotional experience reported by the participants across two digital settings, written and face to face discussions in Zoom platform. Possible theoretical and pedagogical implications for the implementation of contentious discussions in higher education are discussed.

Parents, Teachers, Peers – Who matters most for school students' subjective and objective stress?

Keywords: Emotion and Affect, Motivation and Emotion, Social Aspects of Learning and Teaching, Social Interaction

Presenting Author: Frances Hoferichter, University of Greifswald, Germany; **Co-Author:** Miriam Hufenbach, University Greifswald, Germany

Adolescence can be a challenging period for students, as they face multiple changes within themselves (e.g., biological, cognitive) and their environment (e.g., changing relationships with peers and teachers) along with increased school demands and academic expectations. Accordingly, secondary school students commonly experience increased levels of general psychological and school-related stress, which may result in school burnout. According to the Conservation of Resources Theory (Hobfoll, 1989) and the Buffering Hypothesis (Cohen & Wills, 1985) supportive social relationships may protect individuals from experiencing stress. So far, this theoretical framework has mainly been investigated with subjective stress measures. However, combining self-report data and biological stress markers to investigate the association between supportive social relationships and subjective and objective stress more deeply presents a promising approach for interventional programs. The current study is based on self-report data, alpha-amylase and cortisol levels of 79 German students (48% girls, $M_{Age} = 13.73$, $SD = .68$) from secondary schools. Moderation analysis in R revealed that the relationship between students' perceived stress and alpha-amylase was mitigated by supportive relationships with parents and teachers. Furthermore, parental support buffered the relationship between students' feeling of inadequacy, as a dimension of school burnout, and alpha-amylase as well as psychosomatic symptoms and cortisol. The study hints to a differentiated function of parents and teachers with regards to students' subjective and objective stress.

Does confusion predict greater engagement in learning physics?

Keywords: Educational Psychology, Emotion and Affect, Motivation and Emotion, Primary Education

Presenting Author: Barbara Balaž, Catholic University of Croatia, Croatia; **Co-Author:** Nina Pavlin-Bernardic, Faculty of Humanities and Social Sciences, Croatia

Epistemic emotions are one of four categories of academic emotions, which have object focus on knowledge and generation of knowledge. In this research we were specifically interested in epistemic confusion, which can be described as a notable lack of understanding and signals that a student is confronted with impasses in learning, which leads to cognitive disequilibrium. To resolve the impasse and restore the cognitive equilibrium, students need to engage in effortful problem-solving activities. If students do not manage to resolve the impasse and get stuck in solving the problem, they will experience frustration which may transition to boredom and quitting from further learning process. In this study we wanted to test this assumption, specifically among elementary school students. The aim of the study was to examine the role of epistemic confusion in predicting engagement in learning physics. A convenience sample of 545 students from elementary schools from Zagreb, Croatia, participated in the study. Students filled out the questionnaires about epistemic emotions and engagement in learning physics. The results showed that confusion was a negative predictor of cognitive, behavioral, and emotional engagement in learning physics. This may lead to conclusion that elementary school students do not necessarily have adequate skills to successfully regulate confusion in order to benefit from the experience of confusion while studying, as it may benefit older students.

Teachers and Student Creativity in Elementary School

Keywords: Communities of Learners, Educational Psychology, Emotion and Affect, Teaching Approaches

Presenting Author: Adar Ben-Eliyahu, University of Haifa, Faculty of Education, Israel; **Co-Author:** Shoshana Yakobov, University of Haifa, Faculty of Education, Israel; **Co-Author:** Micky Shomron, University of Haifa, Faculty of Education, Israel; **Co-Author:** Hod Orkibi, University of Haifa, Israel

Teachers play an important role in shaping their students' learning outcomes. The current research investigated the interrelations of teachers' beliefs about creativity (BAC) and perception of school climate with creativity indicators (Study 1; $N=92$), using person-centered analyses. Findings revealed that teacher's BAC covary with originality and fluency for most teachers with lower levels of perception of school climate as encouraging learning for self-growth. Additionally (Study 2; $N_{Student}=274$; $N_{Teacher}=8$), we investigated these teacher characteristics as they related to student emotions and creativity, using path models.

Findings revealed that teachers' creative self-efficacy associated positively with students' creative self-efficacy, teachers' perceptions of school climate associated positively with students' epistemic emotions and creative self-efficacy. Surprisingly, teachers' BAC were negatively associated with students' positive emotions, epistemic emotions and class satisfaction, and students' BAC (students' desirability of creativity for learning, growth, and fixed mindsets). Theoretical and practical implications for further research are discussed.

Emotion understanding and language among preschool-age single and dual language learners

Keywords: Developmental Processes, Emotion and Affect, Language (L1/Standard Language), Social Development

Presenting Author: Ankica Jurkic, University of Bern, Institute of Educational Science, Switzerland; **Presenting Author:** Simone Halliday, University of Bern, Institute of Educational Science, Switzerland; **Co-Author:** Tina Hascher, University of Bern, Institute of Educational Science, Switzerland

This study examines the association between social-emotional competencies and language learning among single language learning children (SLL) and dual language learning children (DLL). Emotion understanding, productive and receptive vocabulary, and sentence comprehension were assessed cross-sectionally among 149 four-year-old (35-78 month) children from Switzerland and Germany. Findings indicate that French and German speaking single language learners demonstrated better language skills than dual language learners, who additionally spoke either Italian or Turkish. For all children, emotion understanding was positively related to receptive vocabulary and to sentence comprehension. However, emotion understanding was positively associated with receptive vocabulary among DLL only. Thus, DLL may rely more heavily on their ability to recognize and interpret emotion when learning and deciphering new vocabulary. Taken together, emotion understanding may be an important process underlying language development and effective target for early intervention, especially among DLL, who may particularly need extra linguistic support.

Assessing Academic Emotions in Civic Education: Development and Validation of Self-Report Scales

Keywords: Citizenship Education, Educational Psychology, Emotion and Affect, Motivation and Emotion

Presenting Author: Elisabeth Graf, University of Vienna, Austria; **Co-Author:** Dana Murano, ACT, United States; **Co-Author:** Thomas Götz, University of Vienna, Austria

Research in educational psychology frequently focuses on the role emotions play in learning and on related antecedents and outcomes. However, studies often focus on a restricted number of subject domains such as mathematics, languages, or science. As civic education differs in relevant aspects from other educational disciplines (e.g., due to its cross-curricular nature and its tendency to incorporate recent political and social developments), there is a need to develop and validate scales focusing on emotions as they specifically relate to this subject. In the proposed study, we develop and validate self-report scales for three instances of civic education in which emotions likely are elicited: a class-related emotions scale, a (cross-curricular) political discussions-related emotions scale, and an epistemic emotions scale focusing on emotions experienced during processing of political information. Additionally, political topic emotions (e.g., emotions towards politicians or policy issues) are assessed using single-item emotions scales. All scales will be validated using data (expected $N = 500$) from students of part-time vocational schools (class-related emotions) and full-time vocational and non-vocational schools of the academic track (discussions-related emotions) at grade 10 to 13 in Austria. Data collection is planned for April 2021, and results will be available for presentation at EARLI. The newly developed and validated scales can contribute to the understanding of emotions and their relationship to teaching and learning in civic education and broaden theories on emotions to an additional domain. Further, the study aims to offer practical implications for the improvement of the quality of civic education.

27 August 2021 15:45 - 16:45

Session Room 17

Poster Presentation

Higher Education, Motivational, Social and Affective Processes

Motivation and Emotion

Keywords: At-risk Students, Attitudes and Beliefs, Content Analysis, Educational Attainment, Educational Psychology, Emotion and Affect, Higher Education, Mixed-method Research, Motivation, Motivation and Emotion, Professions and Applied Sciences, Qualitative Methods, Self-regulation, Social Aspects of Learning and Teaching, Vocational Education

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion

Chairperson: Mareike Kholin, German Institute for Adult Education - Leibniz Centre for Lifelong Learning, Germany

Motivation of first-year nursing students in France

Keywords: Higher Education, Motivation, Motivation and Emotion, Professions and Applied Sciences

Presenting Author: Margault Sacré, Université Clermont Auvergne & Université de Liège, France; **Co-Author:** Benjamin Le Hénaff, Université Clermont Auvergne, France; **Co-Author:** Marie-Christine Toczek, Université Clermont Auvergne, France; **Co-Author:** Dominique Lafontaine, Université de Liège, Belgium

The aim of this paper is to present the results of a study carried out in six nursing schools (Sacré et al., submitted). French nursing schools take in a very specific public since the students enrolled present an atypical profile of academic and professional background. The motivation of the students depends in particular on their involvement in training, the quality of their self-regulation strategies and the construction of their knowledge (Bråten & Olaussen, 2005; Guay & Vallerand, 1996; Harackiewicz, 1979; Hill, 2013). Therefore, it seems essential to understand the motivations that determine the choice of these students. This study proposes to identify the different types of motivation of 538 students entering nursing schools, through the theory of self-determination. The results show a prevalence of motivation intrinsic to knowledge and stimulation, as well as the importance of achievement and self-satisfaction. Student choice also seems to be regulated by the guarantee of employment. Finally, amotivation is not characteristic of these students. These results are discussed in the light of their background and previous scientific literature.

Why Do They Enroll in this Course? Undergraduates' Course Choice from a Motivational Perspective

Keywords: Attitudes and Beliefs, Educational Attainment, Higher Education, Motivation

Presenting Author: Hye Rin Lee, University of California Irvine, United States; **Co-Author:** Luise von Keyserlingk, University of California, Irvine, United States; **Co-Author:** Richard Arum, University of California, Irvine, United States; **Co-Author:** Jacquelynne Eccles, University of California, Irvine, United States

Why do students pick various courses? Interdisciplinary research has highlighted the role of structural constraints, normative expectations, and individual motivation as the joint influences of agency and structure in the service of life goals. We examined undergraduates' reasons for course choices for their most difficult and most important courses, and investigated if reasons differed for non-major required versus major required courses, for freshman versus juniors, and across different disciplines. College students selected courses that fulfilled their major or breadth requirements, particularly in their freshman year. STEM courses were taken more for career development reasons than other disciplines, particularly humanities courses; social sciences courses were taken more for interest than STEM courses; and humanities courses were taken more for intellectual broadening than STEM courses.

Expert perspectives on motivation regulation strategies targeting enjoyment of learning

Keywords: Motivation, Motivation and Emotion, Qualitative Methods, Self-regulation

Presenting Author: Emily Corwin-Renner, Hector Research Institute of Education Sciences and Psychology, Germany; **Co-Author:** Kou Murayama, Hector Research Institute of Education Sciences and Psychology, Germany

Despite humans' natural curiosity, students are often faced with learning tasks at or for school, which they do not find enjoyable. Although changing one's approach to the task can make initially unenjoyable tasks more enjoyable, students are often not aware of such motivation regulation strategies. To find out which strategies may be most effective for making learning tasks more enjoyable, we interviewed 13 education researchers with expertise in the topics of interest, enjoyment of learning, self-regulation, and metamotivation. In these semi-structured interviews, experts were asked to recommend strategies a student could use to make an assigned reading, math, or other task more enjoyable. Thematic analysis revealed three different strategy approaches: adapting the task itself, adapting one's perspective, or adapting the environment. The first approach included strategies involving goal setting and gamification, adding one likable element to the task, and making the task more interactive. The second approach included the strategies involving connecting the task to one's established interests, making oneself more aware of the knowledge gap to encourage curiosity, using imagination, understanding the ultimate purpose of the task, and approaching the task with the intention to teach others. The last approach included the strategies of working together with others and finding an environment that is pleasant and de-emphasizes appealing alternative activities. The identification of this set of promising strategies opens the door to future research testing their efficacy and ultimately to interventions empowering students to motivate themselves and have more positive experiences with learning.

COVID-19 effects on teachers' teaching-related emotions in spring 2020

Keywords: Content Analysis, Emotion and Affect, Higher Education, Social Aspects of Learning and Teaching

Presenting Author: Jere Riekkinen, Tampereen yliopisto, Finland; **Co-Author:** Mari Murtonen, University of Turku, Finland; **Co-Author:** Tahani Aldahdouh, Tampere University, Finland; **Co-Author:** Trang Nguyen, University of Turku / Faculty of Education, Finland; **Co-Author:** Henna Vilppu, University of Turku, Finland

This study was focused on how higher education teachers felt about teaching during the COVID-19 and what were reasons behind those feelings. A total of 378 teachers working at Tampere universities filled in a self-reported questionnaire and answered open-ended question in spring 2020. The data were analyzed with qualitative methods, such as coding and themed design. Mostly the COVID-19 had affected negatively to the teacher's feelings. However, some had found new ways and habits of teaching and intended to use them in the future as well. Seven reasons behind the feelings were found explaining how the COVID-19 had affected teachers: time management, technical change, worry of/trust in students, change in planning and evaluation, change in pedagogy, physical change, change in the work environment, and a change in communication.

Validation of the Task Value Assessment for Secondary Students Scale with Portuguese students

Keywords: Educational Psychology, Motivation, Motivation and Emotion, Vocational Education

Presenting Author: Pedro Leite da Silva, ISPA-Instituto Universitário, Portugal; **Co-Author:** Francisco Peixoto, ISPA - Instituto Universitário / CIE - ISPA, Portugal

AbstractThe Expectancy Value Theory has seen some development in the last years namely by the increasing attention given to the cost dimension as well as the refinement of the other dimensions of the model. In this paper we aim to present the results of the process of validation of the Task Value Assessment for Secondary Students scale (TVASSS) from Gaspard et al. (2017) with Portuguese students following a VET track. The TVASSS, comprising 37 items distributed along 10 dimensions were completed by 420 students attending the tenth and twelfth grade at VET Schools. Confirmatory Factor Analysis confirmed the structure of 10 factors both for Portuguese and Mathematics subjects. Furthermore, all the dimensions showed very good reliability. We can conclude that TVASSS showed very good psychometric properties and can be a good instrument to assess values related to school with Portuguese students attending secondary education.

Piloting a Control-Value Intervention Promoting Adaptive Achievement Emotions in University Students

Keywords: At-risk Students, Emotion and Affect, Higher Education, Mixed-method Research

Presenting Author: Christiane Hoessle, University of Munich (LMU), Germany; **Co-Author:** Kristina Loderer, University of Augsburg, Germany; **Co-Author:** Reinhard Pekrun, Ludwig-Maximilians-Universität, Germany

During higher education, adolescents are confronted with several achievement-related and emotional challenges, which can negatively impact one's educational

and occupational career. Therefore, we developed and piloted a self-guided web-based control-value-intervention (CVI) for university students. Rooted in the control-value theory of achievement emotions (Pekrun, 2006), the CVI aims to promote adaptive achievement emotions and to prevent maladaptive achievement emotions by increasing perceived control, perceived utility value and reducing excessive negative value. To do so, it combines three established treatment approaches: (1)Attributional retraining (AR); (2)Mindset intervention (GM); (3)Utility value intervention(UV). To address excessively high value of failure (attainment value; AV) a further approach was added.

Eighty-eight university students were randomly assigned to one of four groups: control intervention (AR+GM), the value intervention (UV+AV), the full CVI (AR+GM+UV+AV), or a no-treatment control group. Students in the intervention conditions were instructed to complete the respective exercises within four weeks. Outcome measures (perceived control, perceived value, growth mindset, achievement emotions) were assessed at pretest, posttest, and a post-treatment follow-up (after four weeks). At posttest participants in the intervention conditions provided feedback on which aspects of the intervention they found helpful and how the intervention could be improved. The results indicate that the interventions had positive effects on utility value and seem to have prevented boredom from increasing over the 8-week-period compared with the control group. The qualitative data suggest that participants found most of the interventions' content helpful. Implications for improving the intervention and future research will be discussed.

Session Z 10

27 August 2021 15:45 - 16:45

Session Room 9

Poster Presentation

Assessment and Evaluation, Higher Education, Learning and Instructional Technology

Learning Approaches and Higher Education

Keywords: Action Research, Assessment Methods and Tools, Cognitive Skills, Collaborative Learning, Competencies, Computer-supported Collaborative Learning, Experimental Studies, Higher Education, Language (Foreign and Second), Learning Approaches, Mixed-method Research, Problem-based Learning, Quasi-experimental Research, Reflection, Student Learning, Survey Research, Teaching Approaches

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Aleksander Kocaj, Institute for Educational Quality Improvement (IQB), Germany

Age-based differences in effects of sensorimotor- and multisensory-enriched vocabulary training

Keywords: Action Research, Experimental Studies, Language (Foreign and Second), Learning Approaches

Presenting Author:Brian Mathias, Technical University Dresden, Germany; **Co-Author:**Christian Andrä, University of Leipzig, Germany; **Co-Author:**Anika Schwager, University of Leipzig, Germany; **Co-Author:**Manuela Macedonia, Johannes Kepler University Linz, Austria; **Co-Author:**Katharina von Kriegstein, Technical University Dresden, Germany

Both children and adults have been shown to benefit from the integration of sensorimotor and multisensory enrichment such as gestures and pictures into pedagogy. The present study was motivated by previous findings that adults—but not elementary school children’s—foreign language (L2) vocabulary learning benefits to a greater extent from sensorimotor than from multisensory enrichment. We addressed whether twelve- and fourteen-year-old school children would display enrichment benefits that are more comparable to those displayed by adults or elementary school children. The children learned concrete and abstract L2 vocabulary using gestures, pictures, or with no enrichment (auditory-only learning) and were tested on their memory for the vocabulary 3 days, 2 months, and 6 months following learning. We found that both picture and gesture enrichment enhanced both age groups’ memory for the vocabulary relative to non-enriched learning. Interestingly, however, gesture-enriched learning was even more beneficial than picture-enriched learning for the fourteen-year-olds, while the twelve-year-olds benefitted equivalently from learning enriched with pictures and gestures. These differences were not modulated by testing time point or by vocabulary type. This suggests that the effectiveness of gesture and picture enrichment techniques differs between younger and older L2 learners, and that congruent information presented in visual and motor modalities during auditory word learning may be differentially weighted by learners of different ages. The current findings provide evidence-based grounds for opting to integrate gestures into L2 vocabulary teaching for school children starting at fourteen years of age.

Transformative Learning in Higher Education:Towards the Holistic Education in the Age of Uncertainty

Keywords: Competencies, Higher Education, Learning Approaches, Problem-based Learning

Presenting Author:Anastasia Falkenstern, Justus-Liebig-University Giessen, Germany; **Co-Author:**Edith Braun, Justus-Liebig-University Giessen, Germany

Preparing 21st century students with discipline-specific knowledge is not sufficient to cope with future challenges since the future is unpredictable. The rapid social transformations in various spheres of life lead to the question, how the higher education should be to prepare students for the “unknown future” (Barnett 2004)? Furthermore, the fact that the world of work and expert knowledge are changing at a rapid pace as well as the unpredictable dynamics in community relations lead to the obvious assumption that a number of skills such as problem-solving ability, critical and analytical thinking, creativity, communication skills appear to be the essential and future-oriented competencies. An undisputed assumption is that an active citizen who is able to contribute to social, cultural and economic progress and cope with unpredictable challenges is equipped with these skills, especially with communicative skills since communication is a key instrument for coordinating social action and community relations. Educational policymakers and numerous researchers emphasise the role of communication skills as an important learning outcome and educational objective (Griffin et al. 2012; European Commission 2019).The following research question arises: Which learning formats are suitable for facilitating holistic education? The intention of our poster presentation is to illustrate our ongoing research on role-playing as an educational technique and its implementation in higher education to promote communicative competence. This method had its first implementation in 11 different German higher education institutions. We will present our continuing research project with an overview of its theoretical and methodological framework.

The effects of a Biomedical Sciences curriculum reform on students' perceived competence development

Keywords: Competencies, Higher Education, Mixed-method Research, Problem-based Learning

Presenting Author:Sanne Rovers, Maastricht University, Netherlands; **Co-Author:**Anique de Bruin, Maastricht University, Netherlands; **Co-Author:**Jeroen Van Merriënboer, Maastricht University, Netherlands; **Co-Author:**Hans Savelberg, Maastricht University, Netherlands

In 2016-2017, our university revised its Biomedical Sciences bachelor curriculum in order to align with the principles of competency-based education. We conducted a longitudinal study to investigate whether this reform had the desired effects on students' perceived development of general academic competencies. Results indicated that although students from the revised curriculum indeed reported a greater development of these competencies, they also tended to experience lower self-efficacy towards studying Biomedical Sciences. Findings from focus groups helped to shed light on these seemingly conflicting results, and indicate a need for clear assessment criteria, adjusted to the developmental level of the students as they progress through the various years of their bachelor's program.

University students' resilience and self-management: in support of deep approaches to learning?

Keywords: Cognitive Skills, Higher Education, Learning Approaches, Survey Research

Presenting Author:Sonia Ilie, University of Cambridge, United Kingdom; **Co-Author:**Jan Vermunt, Eindhoven University of Technology, Netherlands

Current events are placing increasing pressures on students. With changing teaching and learning modes, and high levels of uncertainty, students' resilience is being tested, at the same time as their approaches to learning may be shifting. Against this backdrop, we explore the link between student resilience and self-management approaches; and how resilience and self-management are independently and together linked with students' deep approaches to learning. We use data from a large-scale pre-pandemic longitudinal survey of students in English universities, following a group of over 2,000 students over three separate rounds, using new and existing scales to capture cognitive, metacognitive, and affective processes around learning. We apply statistical techniques including linear regression and growth modelling to find partial support for our hypotheses that high levels of resilience offer a protective effect for initially low levels of self-management and are strongly associated with later approaches to learning. Finally, we discuss the student support and policy implications of findings that

suggest differences in the levels, relationships, and changes in resilience, self-management and deep approaches to learning by student socio-economic background, mode and level of study, and university subjects.

Reflecting on lived experiences in story completions of higher education faculty

Keywords: Higher Education, Mixed-method Research, Reflection, Teaching Approaches

Presenting Author: Kinga Kaplar-Kodacsy, Eötvös Loránd University, Hungary; **Co-Author:** Helga Dorner, Eötvös Loránd University, Hungary

Complex exploration of the concepts and approaches of higher education (HE) faculty often becomes available through direct or indirect reflections on critical pedagogical incidents (Tripp, 2011). In this study, we explore reflections of lived through experiences of teachers in HE by using the story completion method (Clarke et al., 2017) within the analytical framework of signature pedagogies (Shulman, 2005). The analysis of the results in our mixed methods study shows that teachers of HE with diverse experience in different disciplines provide an authentic insight into the pedagogical concepts and related pedagogical approaches through their story completions. Findings are discussed on two levels: (1) on conceptual and on (2) methods level in order to present the impact of the educators' pedagogical experiences on their pedagogical concepts and approaches, and to thematize the differences between pedagogical concepts and approaches on the basis of disciplinary and teaching experience.

Collaborative synthesis writing quality and collaboration satisfaction: the impact of roles

Keywords: Collaborative Learning, Computer-supported Collaborative Learning, Higher Education, Quasi-experimental Research

Presenting Author: Karen Putseys, Ghent University, Belgium; **Co-Author:** Bram De Wever, Ghent University, Belgium

Within the context of our information society, writing to learn has an important position at university. Writing synthesis texts fosters students' writing skills as well as their conceptual learning. Previous studies have shown that collaboratively writing synthesis texts can improve synthesis text quality. However, writing synthesis texts collaboratively is challenging for students. First, students need to learn to select, organize, and connect information into a new, meaningful text (learning to write). Second, they need to learn how to collaborate efficiently, which does not often happen spontaneously. In this study, the domains of writing and collaborative learning are intertwined. The main aim was to investigate the degree to which assigning roles affects students' collaboration satisfaction and the quality of their collaboratively written synthesis texts. An intervention study was set up with 41 groups of three undergraduate students taking a course on academic writing. All groups wrote two synthesis texts: an abstract and a conclusion of provided research articles. For the abstract, all groups received instruction on synthesis writing. For the conclusion, the groups were divided in two conditions: a control condition receiving only instruction on synthesis writing, and an experimental condition receiving in addition roles guiding their collaboration process. Collaboration satisfaction was measured through an adapted version of the Teamwork Satisfaction Scale. Text quality will be analyzed using comparative judgment. Preliminary results show no significant difference between the two conditions regarding collaboration satisfaction. This will be discussed at the conference, together with more detailed results on the text quality and implications.

How first year experience relates to university students' cognitive, social, and value developments

Keywords: Assessment Methods and Tools, Higher Education, Student Learning, Survey Research

Presenting Author: Maggie Zhao, The University of Hong Kong, Hong Kong

First year experience is crucial for students' development during university studies. The present study applied linear mixed-effects model to examine the extent to which university student's first year experience predicted their perceived learning outcomes at the end of undergraduate study based on a variety of first year aspects including orientation, transition, goal setting, academic learning environment, residential experience, and campus activity participation. Furthermore, comparisons were made between local students versus non-local students in terms of the predictive effect of the first year experience variables. Findings indicated that goal setting was the only first year experience component that significantly predicted the cognitive learning outcome above and beyond the autoregressive effect. Hall experience significantly predicted the social learning outcome, and goal setting and hall experience significantly predicted the value learning outcome. The study adds new findings to the higher education literature and makes practical implications for informing curriculum design and enhancing learning and teaching environment in higher education settings.

Session Z 11

27 August 2021 15:45 - 16:45

Session Room 13

Poster Presentation

Instructional Design, Learning and Instructional Technology, Teaching and Teacher Education

Computer-assisted Learning

Keywords: Computer-assisted Learning, E-Learning/Online Learning, Educational Psychology, Game-based Learning, Instructional Design, Learning Analytics, Metacognition, Mixed-method Research, Multimedia Learning, Primary Education, Problem-based Learning, Quantitative Methods, School Effectiveness, Self-regulation, Vocational Education

Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 14 - Learning and Professional Development, SIG 18 - Educational Effectiveness and Improvement, SIG 27 - Online Measures of Learning Processes

Chairperson: Nurit Gur-Yaish, Oranim Academic College of Education, Israel

Fostering Learning in Computer-based Office Simulation by Problem-Solving Analytics (PSA)

Keywords: Computer-assisted Learning, Learning Analytics, Problem-based Learning, Vocational Education

Presenting Author: Andreas Rausch, University of Mannheim, Germany; **Co-Author:** Juergen Seifried, University of Mannheim, Germany; **Co-Author:** Viola Deutscher, University of Mannheim, Germany; **Co-Author:** Esther Winther, University of Duisburg-Essen, Germany; **Co-Author:** Steffen Brandt, Opencampus.sh, Germany; **Co-Author:** Sabrina Ludwig, University of Mannheim, Germany; **Co-Author:** Sophia Gentner, University of Mannheim, Germany; **Co-Author:** Chris Mayer, University of Mannheim, Germany; **Co-Author:** Georg Dariush Gorshid, University of Mannheim, Germany; **Co-Author:** Anke Braunstein, University of Mannheim, Germany; **Co-Author:** Jessica Paessens, University of Duisburg-Essen, Germany

To prepare employees for domain-specific problem solving, we develop an intuitive computer-based office simulation that provides typical tools such as a spreadsheet application or an ERP software. It allows learners to face realistic scenarios and vocational teachers and in-firm trainers to observe and improve learners' performance in authentic settings. Based on log files, which record the user behavior, individual problem-solving processes are analysed to identify general and domain-specific strategies and errors („Problem-Solving Analytics“, PSA). Thereby the approach serves as an intelligent tutoring system in a scenario-based open-ended e-learning environment. In our contribution, we will outline the scientific relevance of problem-solving analytics. Followed by an introduction of the computer-based office simulation “LUCA” (funded by the German Federal Ministry of Education and Research) and its analytical framework that fosters problem-solving competence in the business domain.

Extrinsically integrated instructional quizzes in learning games: an educational disaster or not?

Keywords: Computer-assisted Learning, Game-based Learning, Instructional Design, Multimedia Learning

Presenting Author: Cyril Brom, Charles University, Czech Republic; **Co-Author:** Lucie Jičinská, Faculty of Education, Charles University, Czech Republic; **Co-Author:** Petra Sedláčková, Faculty of Arts, Charles University, Czech Republic; **Co-Author:** Lukáš Kolek, Faculty of Mathematics and Physics, Charles University, Czech Republic; **Co-Author:** Tereza Teturová, Faculty of Education, Charles University, Czech Republic; **Co-Author:** Kristina Volná, Czech Television, Czech Republic; **Co-Author:** Jiří Lukavský, Institute of Psychology, Czech Academy of Sciences, Czech Republic

Instructional quizzes are frequently used in educational games. When they present correct answers after learners have responded, these quizzes can be used for teaching new factual and conceptual knowledge on their own (no additional learning materials are needed). In games, these quizzes are often unrelated to the gameplay: the gameplay can be viewed as a reward for answering the quiz questions. This has been widely criticized in the game-based learning literature

as a 'sugar-coating-broccoli' approach. However, is this really a bad approach? Theories offer conflicting predictions concerning instructional efficiency of in-game quizzes relative to bare quizzes (i.e., not embedded in games) and the empirical literature is lacking. Here, we present an on-going, within-subject design study ($N = 69$), in which children 10-12 years of age study from both an in-game quiz and a bare quiz and receive immediate and 2-3 weeks delayed post-test on the quiz questions. Dependent variables include test scores (concerning in-game quiz vs. bare quiz questions), enjoyment (game vs. quiz), and preference. Data has been collected. Preliminary analysis indicates moderate difference between learning outcomes from an in-game quiz versus a bare quiz in immediate post-tested, but no significant difference in the delayed post-test. The game was more enjoyed than and preferred to the bare quiz, but it took, of course, longer to complete the game compared to the bare quiz. The final analysis will be presented at the conference and the results will be discussed from theoretical as well as practical perspectives.

Digital Learning

Keywords: Computer-assisted Learning, E-Learning/Online Learning, Quantitative Methods, School Effectiveness

Presenting Author:Falk Radisch, Institute of school education and educational research, Germany; **Co-Author:**Larissa Habeck, University Rostock, Germany; **Co-Author:**Mona Arndt, University Rostock, Germany

Schools play a key role in teaching students how to use digital media. Students have to be prepared for future requirements. Another point is that individual learning is possible using digital tools and communication platforms. Due to the school closures during the COVID 19 pandemic, schools are faced with the challenge of teaching and individual learning in distance. Here, not only digital resources but also experiences with digital learning play a crucial role. Our results show that principals and teachers have more experience with digital learning than students and their parents. With regard to the equipment at the schools, it is obvious that neither the teachers nor the students are sufficiently equipped with mobile devices at school. Nevertheless, it is evident that the pandemic has triggered new developments and that, for example, new concepts of media use are finding their way into schools. This opens up new perspectives for individual learning.

VR learning environments: Is it possible to support orientation with cueing?

Keywords: Computer-assisted Learning, Educational Psychology, Instructional Design, Multimedia Learning

Presenting Author:Daniela Decker, Deutsches Institut für Erwachsenenbildung, Germany; **Co-Author:**Martin Merkt, Deutsches Institut für Erwachsenenbildung, Germany

Addressing user disorientation as one of the major challenges in virtual reality (VR) environments, this project investigates whether cueing techniques for attention guidance in VR (i.e., light effects, sound, and movement) affect learning, orientation, and enjoyment. The learning environment is a virtual workshop, where participants build a virtual work piece according to a construction plan. While participants are building the work piece, additional learning material is provided by an off-screen narrator. The tools and pieces that participants need to build the work piece are distributed in the VR environment. Participants will be randomly assigned to one of two experimental conditions. In the cued condition, the objects that participants need for the next step will be highlighted, whereas no such support will be provided in the uncued condition. We assume that cueing improves learning outcomes, but actually hinders learners' generation of a mental representation of the spatial structure of the VR environment. It is planned to conduct the experiment in spring 2021, so that the data will be available at the conference.

Interactive learning platforms for teaching occupation-specific content in healthcare professions

Keywords: Computer-assisted Learning, Mixed-method Research, Problem-based Learning, Vocational Education

Presenting Author:Anna-Teresa Engl, Technische Universität München (TUM), Germany

Lesson planning and teaching of subject content using digital media poses a variety of challenges for prospective teachers. In this comparative study the extent to which the use of a digital learning platform affects the professional knowledge of prospective teachers is presented. We use the example of the interactive patient case of the INMEDEA simulator. Here, the professional knowledge is defined with regard to the TPACK model. In this comparison, a teaching session is laid out based on a traditional paper based patient case. Our sample consists of Bachelor's and Master's students of different teacher education programs in the field of health and nursing sciences. The data is collected with mixed methods (questionnaire, teaching material and interview). Currently, the developed questionnaire and the learning environment are piloted. For the main survey, at least 250 participants will take part. First results will be discussed in summer '21. Higher competence in all these areas of technological knowledge (TK), content knowledge (CK), technological-content knowledge (TCK), pedagogical content knowledge (PCK) and the technological pedagogical content knowledge (TPCK) as well as distinctive action-oriented tasks in the context of lesson planning are expected for the experimental group.

Metacognitive Support in Digital Learning Environments for Primary School Students

Keywords: Computer-assisted Learning, Metacognition, Primary Education, Self-regulation

Presenting Author:Doreen Prasse, Schwyz University of Teacher Education, Switzerland; **Presenting Author:**Michael Hielscher, Pädagogische Hochschule Schwyz, Switzerland; **Co-Author:**Glenia Iten, Schwyz University of Teacher Education, Switzerland; **Co-Author:**Martina Conti, Schwyz University of Teacher Education, Switzerland; **Co-Author:**Rea Minder, Schwyz University of Teacher Education, Switzerland; **Co-Author:**Franziska Aeschlimann, Schwyz University of Teacher Education, Switzerland

Effective learning in digital learning environments requires a degree of proficiency in self-regulation skills that especially younger students in primary school may not yet have acquired (Devolder et al., 2012). Although this represents a challenge, digital learning environments at the same time offer numerous opportunities to promote self-regulated learning, for example by providing a student with digital metacognitive prompts and scaffolds. Expanding possibilities regarding formats, frequency, timing and adaptability of digital prompts open up new opportunities to activate and also automatize metacognitive activities. However, the potential of digital learning environments to promote self-regulated learning has so far not received sufficient attention in the primary school environment. Therefore, we developed and tested a software-based support system (i.e. Learn2Learn-Assistant), which, by providing metacognitive prompts, helps primary students with planning and monitoring as crucial elements of self-regulated learning. To empirically test this newly designed Learn2Learn-Assistent, we developed a digitally supported learning unit ("Mysterious Glaciers") and conducted field experiments in 20 primary-school classes at grades 5/6 ($n=370$) in a pre-post test experimental design (within class randomization). The presentation will describe and discuss the theoretical basis and practical design of the Learn2Learn-Assistant and the learning unit, and include first results from our analysis of student interviews exploring students' interaction with the Learn2Learn-Assistant and the learning benefits they experienced during the intervention.

Session Z 12

27 August 2021 15:45 - 16:45

Session Room 14

Poster Presentation

Higher Education, Motivational, Social and Affective Processes, Teaching and Teacher Education

Teacher Professional Development

Keywords: Attitudes and Beliefs, Collaborative Learning, Communities of Practice, Cultural Diversity in School, Developmental Processes, E-Learning/Online Learning, Goal Orientation, Higher Education, Informal Learning, Inquiry Learning, Motivation, Social Interaction, Teacher Effectiveness, Teacher Professional Development, Workplace Learning

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion, SIG 14 - Learning and Professional Development, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Brian Cahill, Germany

Building a Community of Practice to empower teachers in using open access educational resources

Keywords: Collaborative Learning, Communities of Practice, Cultural Diversity in School, Teacher Professional Development

Presenting Author: Theresa Ruwe, Humboldt University Berlin, Germany; **Co-Author:** Maria Zimmermann, Humboldt University of Berlin, Germany; **Co-Author:** Elisabeth Mayweg, Humboldt University of Berlin, Germany

Collaboration and exchange – especially in digital environments – are given an increasingly important role in our society (not only against the background of a pandemic). In this context, Communities of Practice (CoPs) which offer a platform for these and thus have the potential to innovate learning, are a hot topic, and research on them is crucial. This study focusses on teacher CoPs whose practitioners are expected to gain and subsequently transfer their acquired knowledge and skills to their students. One way of doing so gaining more and more popularity is teachers' use of open educational resources (OERs). Consistently, providing OERs comes along with ensuring their quality, not only in terms of their contents but their sustainable and successful handling by teachers. In our study, we took advantage of CoPs' potential and approached the sustainability and success of OERs – defined as the appropriate handling of the materials by teachers – by building a teacher CoP. Within the scope of the EU's Horizon 2020 project DIALLS (Dialogue and Argumentation for cultural Literacy Learning in Schools), 114 teachers from four countries participated in the study investigating the appropriateness of CoPs as a means of facilitating and ensuring the successful handling of OERs by teachers. We collected quantitative as well as qualitative data assessing the success of the CoP. Results are discussed in the context of good practices for scaffolding CoPs in an online environment and developing sustainable OERs after introducing the concepts and their intersections.

The development of lecturers' collaboration networks during departmental professional development

Keywords: Higher Education, Social Interaction, Teacher Professional Development, Workplace Learning

Presenting Author: Ine Noben, University of Groningen, Netherlands; **Co-Author:** Jasperina Brouwer, University of Groningen, Netherlands; **Co-Author:** Jan Folkert Deinum, University of Groningen, Netherlands; **Co-Author:** Adriaan Hofman, University of Groningen, Netherlands

Professional interaction in the workplace is an indispensable part of professional development. We examined how lecturers' teaching collaboration networks within a university department changed throughout an eight-month professional development project and how these networks influenced lecturers' observation choices in formative peer observations. Stochastic actor-based modeling (SOAM) shows that it was more likely that lecturers started to collaborate when they were working on the same floor (propinquity), were more active in attending project meetings, and had more teaching experience (more than five years). The multiple regression quadratic assignment procedure (MR-QAP) indicates that lecturers were more likely to observe colleagues with whom they already collaborated before the start of the project.

The Use of a Mechanical MOOC to Build a Practitioner Community of Practice in Educational Dialogue

Keywords: Communities of Practice, E-Learning/Online Learning, Inquiry Learning, Teacher Professional Development

Presenting Author: Meaghan Brugha, University of Cambridge, United Kingdom

This poster presents initial findings from a PhD research study that explores the intersection of technology and dialogic pedagogy to enhance teacher professional development and to assist in the development of communities of practice in which practitioners reflect together, support one another, and share practice. An interactive mechanical Massive Open Online Course (MOOC) on educational dialogue was iteratively designed and developed with the use of open source software. This MOOC hosts relevant resources and activities for participating educators to complete online, and is relevant for a wide range of in-service school-level and higher education teachers in varied geographies, along with the lessons for designers and educators learned from trialling it. The research employs a design-based approach with mixed methods for data collection and analysis. Initial findings are presented in five emerging themes concerning how technology can afford new forms of dialogue to support the development of a teacher community of practice.

Nursing teachers' collaboration and professional development

Keywords: Collaborative Learning, Informal Learning, Teacher Professional Development, Workplace Learning

Presenting Author: Veronika Anselmann, University of Education Schwäbisch Gmünd, Germany

Collaboration of teachers at work is seen as important for their professional development (Steyn, 2017). Teacher's professional development at work is defined as teachers' participation in formal and informal learning activities. Gräsel et al. (2006) describes teacher cooperation as collaboration of teacher in the form of exchange, synchronization and co-construction (Drossel et al., 2019). Teaching at schools is often associated with a high degree of individualism and autonomy (Vangrieken et al., 2017). In Germany, nursing education is highly unstructured, lacks of standardization, and nursing teacher are solely responsible for their teaching (di Luzio, 2009). Therefore, the aim of this study is to find out if nursing teachers' estimation of a safe team climate and of resources for collaboration and their beliefs about teacher collaboration influences nursing teacher's accomplishment of collaboration activities of exchange, synchronization and co-construction and how these activities relate to nursing teacher's professional development. We developed an online-questionnaire using validated scales. By now, 81 nursing teacher participated in our study (data collection is still running). We used descriptive analysis and calculated Cronbach's Alpha for scales and correlation analyses. Furthermore, we tested a path model with Mplus. Preliminary results of our study show that teachers' beliefs on collaboration influence accomplishment of collaboration activities of exchange. Their estimation of their resources for collaboration and their safe team climate influence teachers' collaboration in the form of synchronization. Collaboration activities of exchange and synchronization influence teachers' accomplishment of collaboration activities of co-construction and by this their professional development.

Studying the process of teacher resilience development in higher education

Keywords: Developmental Processes, Higher Education, Teacher Effectiveness, Teacher Professional Development

Presenting Author: Mirjami Ikonen, University of Eastern Finland, Finland; **Presenting Author:** Päivi Kosonen, University of Eastern Finland, Finland

The purpose of this study is to examine the aspects of the process of teacher resilience development in higher education context. When studying teacher resilience, the focus is on a chain of minor everyday stressful situations rather than a particular traumatic experience (Clará, 2017). Teacher resilience is about turning this state into one of psychological and emotional equilibrium and well-being. Insofar, the literature review consists of 51 journal articles defining teacher resilience (years 2007–2020). Furthermore, empirical data comprises HE teacher stories and student feedback. The empirical data will be analyzed by methods of content analysis and analysis of narratives. We propose a model in which teacher resilience in HE is understood as a threefold process: first, the teacher's own internal discussion and development, second, by the interaction with colleagues and community, and third, the accumulation of experiences in teaching itself. Developing one's own problem-solving ability, listening to other experiences, getting help, and providing help create a sense of the ability to survive, which is a key element of resilience. We conclude that the process of teacher resilience development involves multiple levels: working with the teacher himself, with the work community, and with the students in a class (in person or online).

Exploring teachers' beliefs in relation to TARGETS dimensions – results of an interview research

Keywords: Attitudes and Beliefs, Goal Orientation, Motivation, Teacher Professional Development

Presenting Author: Tímea Mezei, University of Szeged, Doctoral School of Education, Hungary; **Co-Author:** József Balázs Fejes, University of Szeged, Hungary

This study examined the possibilities of putting the knowledge accumulated by goal theory into practice from the perspective of teachers. Goal theory offers the TARGETS dimensions (Task, Authority, Recognition, Grouping, Evaluation, Time, Social Relationship) to create a motivating classroom atmosphere, however, so far little emphasis has been put on exploring whether teachers actually find these useful in their practice. This research examined what teachers think of the practical usability of TARGETS as well as the factors that affect these beliefs. 21 teachers were interviewed from the senior section (grades 5–8) of various Hungarian primary schools. Interview questions can be categorized into three groups: teachers' qualifications and experience; general beliefs about learning motivation; practical relevance of TARGETS. Results suggest that the majority of TARGETS dimensions are represented in the classrooms of the teachers of the sample, however, teachers rarely support students' autonomy, as they perceive it as something that can be strengthened outside the classroom. Involvement of students in the selection of tasks and activities arises almost only in connection with games or extra credit projects. Facilitating student-student interactions was a strategy that was seldom used. Differentiation, which was connected to the dimensions of task, evaluation and time, was wrongly perceived by most teachers as a relaxation of standards. Teachers of students with average or less favourable family backgrounds were less likely to think they can shape their students'

learning motivation. Results also showed that teachers' beliefs about TARGETS was influenced by the domain they teach.

Session Z 13

27 August 2021 15:45 - 16:45

Session Room 4

ICT Demonstration

Learning and Social Interaction

AMIGO – Algorithmic Method for Improved Group Formation Online

Keywords: Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Educational Technology, Interdisciplinary

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Learning in study groups is an effective learning strategy and is widely used in university learning. However, little attention is paid to the composition of learning groups, although this contributes to the success of learning groups. Empirical findings come almost exclusively from correlative studies, since an experimental manipulation of homogeneity or heterogeneity of learning groups is hardly feasible without algorithmic support. In the context of an interdisciplinary project between psychology and computer science, we employ a software (MoodlePeers; <https://github.com/moodlepeers>), which allows group formation based on predefined criteria. After the selected criteria have been diagnosed in a questionnaire for each person, the algorithm forms groups that are either homogeneous or heterogeneous with respect to the chosen criterion. In this ICT demonstration, a short overview of the theoretical background and previous empirical studies is given. Afterwards, the software will be demonstrated and can be tried out. The target group is on the one hand people who do research on group formation and are looking for a possibility to experimentally form homogeneous or heterogeneous learning groups; on the other hand people are addressed who are looking for a comfortable option to perform an optimized group formation in their university courses.

AMIGO – Algorithmic Method for Improved Group Formation Online

Presenting Author:Henrik Bellhäuser, Johannes Gutenberg-University Mainz, Germany; **Co-Author:**Rene Roepke, RWTH Aachen University, Germany; **Co-Author:**Johannes Konert, Hochschule Fulda - University of Applied Sciences, Germany

Learning in study groups is an effective learning strategy and is widely used in university learning. However, little attention is paid to the composition of learning groups, although this contributes to the success of learning groups. Empirical findings come almost exclusively from correlative studies, since an experimental manipulation of homogeneity or heterogeneity of learning groups is hardly feasible without algorithmic support. In the context of an interdisciplinary project between psychology and computer science, we employ a software (MoodlePeers; <https://github.com/moodlepeers>), which allows group formation based on predefined criteria. After the selected criteria have been diagnosed in a questionnaire for each person, the algorithm forms groups that are either homogeneous or heterogeneous with respect to the chosen criterion. In this ICT demonstration, a short overview of the theoretical background and previous empirical studies is given. Afterwards, the software will be demonstrated and can be tried out. The target group is on the one hand people who do research on group formation and are looking for a possibility to experimentally form homogeneous or heterogeneous learning groups; on the other hand people are addressed who are looking for a comfortable option to perform an optimized group formation in their university courses.

Session Z 14

27 August 2021 15:45 - 16:45

Session Room 2

ICT Demonstration

Learning and Instructional Technology

MEPA : a method to analyze and modelize personal learning environment for researcher and teacher

Keywords: Qualitative Methods, Reflection, Student Learning, Synergies between Learning; Teaching and Research

Interest group: SIG 17 - Methods in Learning Research

This demonstration is intended for researchers and teachers looking for a means to make visible, analyse and build Personal Learning Environments (PLEs). It presents the MEPA method which is specifically designed to model PLEs, as well as the YEPA web application which allows to implement it. The MEPA method is composed of a generic model of the PLE (an ontology) and a modelling language that allows the representation of PLE in their technical, pedagogical, didactic and social dimensions. It integrates a taxonomy of knowledge and skills as well as a taxonomy of cognitive and metacognitive strategies. Specific descriptors are provided for technical tools and educational resources. Others allow the representation of social interactions and the rules and values that regulate them. The method is indicated for the study of learning practices as it enables the association of discourse with the conceptual references included in the MEPA modelling language. YEPA is used in teaching as a means of constructing personal learning projects for students and as a support for learning reports. We will present the theoretical foundations of the method and its application using the YEPA web application by means of a case study resulting from a research on learning practices. The method will be discussed with the participants for its application in research and teaching. Participants will be given access to YEPA for a trial period allowing them to experiment with the MEPA method.

MEPA : a method to analyze and modelize personal learning environment for researcher and teacher

Presenting Author:Joris Felder, Haute école pédagogique de Fribourg, Switzerland

This demonstration is intended for researchers and teachers looking for a means to make visible, analyse and build Personal Learning Environments (PLEs). It presents the MEPA method which is specifically designed to model PLEs, as well as the YEPA web application which allows to implement it. The MEPA method is composed of a generic model of the PLE (an ontology) and a modelling language that allows the representation of PLE in their technical, pedagogical, didactic and social dimensions. It integrates a taxonomy of knowledge and skills as well as a taxonomy of cognitive and metacognitive strategies. Specific descriptors are provided for technical tools and educational resources. Others allow the representation of social interactions and the rules and values that regulate them. The method is indicated for the study of learning practices as it enables the association of discourse with the conceptual references included in the MEPA modelling language. YEPA is used in teaching as a means of constructing personal learning projects for students and as a support for learning reports. We will present the theoretical foundations of the method and its application using the YEPA web application by means of a case study resulting from a research on learning practices. The method will be discussed with the participants for its application in research and teaching. Participants will be given access to YEPA for a trial period allowing them to experiment with the MEPA method.

Session Z 15

27 August 2021 15:45 - 16:45

Session Room 12

ICT Demonstration

Assessment and Evaluation

LSI.J – A tool to investigate receptive language in German-speaking adolescents.

Keywords: Assessment Methods and Tools, At-risk Students, Language (L1/Standard Language), Psychometrics

Interest group: SIG 01 - Assessment and Evaluation

The LSI.J-test tool is a handy, tablet-based assessment device that profoundly describes the receptive language competence of German-speaking adolescents and young adults (figure 1). We implemented 10 tests in 5 areas of language comprehension: early auditory processing, lexicon, syntax, pragmatic skills, and

auditory attention (table 1). Based on the test results, tailor-made supportive actions may be selected from the *LSI.J*-data base, including environmental adjustments, disability compensation, remedial language instruction, or speech and language therapy. Providing these two steps, the *LSI.J*-project aims at contributing to the adolescents' integration and participation in educational and vocational as well as social structures. The tool is developed for applications in educational, clinical, and research settings. Therefore, we specifically emphasize accurate and sophisticated statistical and test theoretical data modelling. In this ICT demonstration, we will provide a case study-based tour through the 10 implemented test procedures and show how the test results may be useful both from an educational as well as a scientific perspective. We would like to present the *LSI.J*-tool to a diverse audience from different occupational backgrounds, discussing requirements for a broader educational use of the tool, further diagnostic demands, and continuing advanced statistical modelling.

LSI.J – A tool to investigate receptive language in German-speaking adolescents.

Presenting Author: Christian W. Glück, Institute of Special Education, University of Leipzig, Germany; **Co-Author:** Carina Denise Krause, Berufsbildungswerk Leipzig / Max-Planck-Institute for Cognitive and Brain Sciences, Leipzig, Germany; **Co-Author:** Susanne Wagner, Berufsbildungswerk Leipzig, Germany

The *LSI.J*-test tool is a handy, tablet-based assessment device that profoundly describes the receptive language competence of German-speaking adolescents and young adults (figure 1). We implemented 10 tests in 5 areas of language comprehension: early auditory processing, lexicon, syntax, pragmatic skills, and auditory attention (table 1). Based on the test results, tailor-made supportive actions may be selected from the *LSI.J*-data base, including environmental adjustments, disability compensation, remedial language instruction, or speech and language therapy. Providing these two steps, the *LSI.J*-project aims at contributing to the adolescents' integration and participation in educational and vocational as well as social structures. The tool is developed for applications in educational, clinical, and research settings. Therefore, we specifically emphasize accurate and sophisticated statistical and test theoretical data modelling. In this ICT demonstration, we will provide a case study-based tour through the 10 implemented test procedures and show how the test results may be useful both from an educational as well as a scientific perspective. We would like to present the *LSI.J*-tool to a diverse audience from different occupational backgrounds, discussing requirements for a broader educational use of the tool, further diagnostic demands, and continuing advanced statistical modelling.

Session Z 16

27 August 2021 15:45 - 16:45

Session Room 5

ICT Demonstration

Assessment and Evaluation

A new method to evaluate movement and shape quality in children's poor handwriting

Keywords: Assessment Methods and Tools, Learning and Developmental Difficulties, Quantitative Methods, Writing/Literacy

Interest group: SIG 12 - Writing

Automaticity is involved in the crucial trade-off relationship between handwriting fluency and legibility (Weintraub & Graham, 1998). A lack of automatization exists in the handwriting of children with DCD and poor handwriting (Prunty, Barnett, Wilmot & Plumb, 2013; Rosenblum & Livneh-Zirinski, 2008). It can be described by two process measures: decreased Number of Inversion in Velocity (NIV), near by or exact 1 indicating a perfect automaticity (Mai & Marquardt, 1995) and a high level of Dynamic Time Warping (DTW) % of coherence, that determines the consistency of the written letter shapes (Di Brina, Niels, Overvelde, Levi, Hulstijn, 2008). NIV and DTW% of coherence are measured and analyzed by the digitizer based examination software CSWin (MedCom, 2016). This instrument provides insight into the mechanisms behind fluent cursive handwriting and of the overall shape characteristics of letters and their variability.

A new method to evaluate movement and shape quality in children's poor handwriting

Presenting Author: Christian Marquardt, Science&Motion GmbH, Germany; **Co-Author:** Carlo Di Brina, Department of Human Neuroscience, Sapienza University of Rome, Italy., Italy; **Co-Author:** Sibylle Hurschler Lichtsteiner, Languages and handwriting research group, University of Teacher Education, Lucerne, Switzerland; **Co-Author:** Melanie Nideröst, University of Teacher Education of Lucerne, Switzerland; **Co-Author:** Werner Wicki, Languages and handwriting research group, University of Teacher Education Lucerne, Switzerland

Automaticity is involved in the crucial trade-off relationship between handwriting fluency and legibility (Weintraub & Graham, 1998). A lack of automatization exists in the handwriting of children with DCD and poor handwriting (Prunty, Barnett, Wilmot & Plumb, 2013; Rosenblum & Livneh-Zirinski, 2008). It can be described by two process measures: decreased Number of Inversion in Velocity (NIV), near by or exact 1 indicating a perfect automaticity (Mai & Marquardt, 1995) and a high level of Dynamic Time Warping (DTW) % of coherence, that determines the consistency of the written letter shapes (Di Brina, Niels, Overvelde, Levi, Hulstijn, 2008). NIV and DTW% of coherence are measured and analyzed by the digitizer based examination software CSWin (MedCom, 2016). This instrument provides insight into the mechanisms behind fluent cursive handwriting and of the overall shape characteristics of letters and their variability.

Session Z 17

27 August 2021 15:45 - 16:45

Session Room 15

Invited Symposium

Motivational, Social and Affective Processes

SIG 8: The Life and Legacy of Stuart A. Karabenick: "Acquired Wisdom? More Like Lessons Learned"

Keywords: Attitudes and Beliefs, Educational Psychology, Metacognition, Motivation, Motivation and Emotion, Self-regulation, Teaching/Instruction

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Fani Lauermann, TU Dortmund University, Germany

Organiser: Fani Lauermann, TU Dortmund University, Germany

Organiser: Hanna Jarvenoja, University of Oulu, Finland

Organiser: Julia Morinaj, University of Bern, Switzerland

Organiser: Martin Daumiller, University of Augsburg, Germany

Discussant: Hanna Jarvenoja, University of Oulu, Finland

The 2021 EARLI SIG-08 Invited Symposium is dedicated to the life and legacy of Dr. Stuart A. Karabenick. Stuart was an exceptional scholar, a great thinker, a kind and generous person, a caring mentor, and a beloved colleague and friend. He is well known for his excellent scholarship in the fields of self-regulation and student and teacher motivation. Stuart was one of the leading experts on the motivational underpinnings and self-regulatory implications of help seeking in educational contexts. In 2016, SIG-08 recognized Stuart's contributions to the profession and our community with a Lifetime Achievement Award—a well-deserved honor for his research excellence and mentorship. This invited symposium will feature four talks by some of Stuart's collaborators, with close ties to EARLI SIG-08 Motivation and Emotion. First, the SIG-08 coordinators will commemorate the many contributions Stuart has made to the SIG. Next, four invited research talks will feature Stuart's legacy and contributions to educational research in the fields of self-regulation, student motivation, and teacher motivation. The first talk (by Gonida, Berger, Schenke, and Ruzek) will focus on academic help seeking and self-regulated learning. The second talk (by Albrecht and Eccles) will focus on student motivation and the role of relevance appraisal processes and relevance beliefs in the development of students' task values. The third talk (by Butler, Richardson, and Watt) will highlight Stuart's contributions to the field of teacher motivation research. Finally, the fourth talk (by Lauermann) will focus on Stuart's research related to teacher responsibility and accountability systems in education.

Stuart A. Karabenick's Legacy in the Field of Academic Help Seeking and Self-regulated Learning

Presenting Author:Eleftheria Gonida, Aristotle University of Thessaloniki, Greece; **Co-Author:**Jean-Louis Berger, University of Fribourg, Switzerland; **Co-Author:**Katerina Schenke, Catalyst Methods, United States; **Co-Author:**Erik Ruzeck, University of Virginia, United States

This presentation will focus on Stuart's contribution in the fields of academic help seeking, self-regulated learning, and student motivation. Specifically, Stuart's work has advanced theory and research along, at least, three lines, which will be discussed in this symposium honoring his legacy: (i) academic help seeking as a self-regulated learning strategy, (ii) classroom environments on student motivation and self-regulated learning, and (iii) strategy-based motivation. Regarding the academic help-seeking process, Stuart contributed to its conceptualization as a self-regulated learning strategy or resource management strategy, studied its relations with personal competences and contextual influences, the construal of help-seeking sources, and studied its role in learning analytics and the use of educational technologies (e.g., in collaboration with Berger, Gonida, Makara, Newman, Puustinen, Teasley). Regarding the impact of classroom environments on student motivation and SRL, Stuart's research focused on the measurement of classroom goal structures, within-classroom differences in students' motivational profiles, and features of the classroom environment that shape students' perceptions of teacher emotional support (in collaboration with Schenke, Ruzeck, Eccles, Lam). Recently, based on expectancy-value theory, Stuart introduced the idea of 'strategy-based motivation,' which suggests that motivational features of students' learning strategies, such as their perceived effectiveness and difficulty of implementation, function as complementary predictors of strategy use and, in turn, of students' learning outcomes and achievement (in collaboration with Berger).

The Relevance of Relevance in Expectancy-Value Theory

Presenting Author:Jeffrey Albrecht, University of Michigan, United States; **Co-Author:**Jacquelynne S. Eccles, University of California-Irvine, United States

For centuries, educational theorists and researchers have called for relevance in education. William James and John Dewey theorized that relevance was critical for academic engagement and comprehension of new information. Beyond calls for educators to "make education relevant," Dewey advocated for teachers to help students learn to make their own connections between academic lessons and their concerns or preoccupations, because he believed that such self-regulated relevance appraisal skills were fundamental to personal and social development both within and outside of schools. In recent years, motivation scientists have grappled with clarifying the meaning of relevance and its distinctions from conceptually similar constructs, especially subjective task value in expectancy-value theory. In this talk, we propose a model for explaining the role of relevance appraisal processes and relevance beliefs in the development of task value.

Stuart A. Karabenick: His Legacy in the Field of Teacher Motivation

Presenting Author:Ruth Butler, Hebrew University of Jerusalem, Israel; **Co-Author:**Paul Richardson, Monash University, Australia; **Co-Author:**Helen Watt, The University of Sydney, Australia

Stuart's enduring interest in both understanding and influencing motivation and self-regulation led him to extend his early focus on learning behaviors in the lab to classrooms and the ways in which teachers promote or undermine adaptive student motivation and self-regulation, to teachers as not only motivating but motivated. Stuart was instrumental in identifying teacher motivation as a new and important field and contributing to its development. Much of our own work in the field of teacher motivation evolved in dialogue with Stuart. In this presentation, we shall highlight two of the many ways in which his interests and contributions resonate with our research. Informed by Stuart's framing of both helping and help seeking as motivated social self-regulation strategies, Butler will present a model and empirical evidence relating teachers' achievement goals to teachers' own help-seeking strategies and to their students' intentions to approach them for needed help. Richardson and Watt will describe the extension of their expectancy-value FIT-Choice model of student teachers' motivations for choosing teaching to the motivations of practicing teachers to remain teachers. In keeping with Stuart's interest in motivational and contextual influences on the effectiveness of teacher participation in professional development, they will present evidence linking teachers' motivations and effectiveness across their career to demands and resources in their working environment.

Taking Teacher Responsibility into Account(ability)

Presenting Author:Fani Lauermann, TU Dortmund University, Germany

One of Stuart A. Karabenick's many contributions to the field of motivation research is his research on the determinants of helping (e.g., Benson, Karabenick, & Lerner, 1976). For instance, his early work has demonstrated that characteristics of the help seeker, such as physical attractiveness and race, affect the probability of receiving help (Stuart identified this study as one of his "favorite studies"). Our shared interest in the determinants and consequences of teacher responsibility for educational outcomes is - in part - a continuation of this early work on help-giving. In this talk, I will reflect on what we have learned, over the past years, about the conceptualization and measurement of teacher responsibility for educational outcomes, about factors that affect teachers' willingness to assume responsibility for their students' educational outcomes and for the quality of their teaching, as well as potential consequences for teachers' wellbeing and instructional decision-making. I will also present new research linking teachers' personal responsibility with their willingness to provide help to an academically struggling student. Finally, I will reflect on the role of teacher responsibility research in an era of educational accountability.