Academic Portfolio

Kahveci Group

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Chemistry Education Research
Kahveci Group

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Introduction

This booklet presents the academic portfolio of the Kahveci Group at DePaul University. We are a research group working in the field of chemistry education research (CER).

If you are reading this document, it means you are interested in our work. We would like to share our expertise with public at large and therefore we devote our time to keep this document in great detail and up-to-date given the fast evolving changes happening day by day. We also value the opinions of the community and would like to hear your feedback.

We are aware that research in social and behavioral sciences varies by tradition. The Kahveci Group is no exception. While we utilize all kinds of research, we conduct basically quantitative research methodologies. Topic-wise, our work includes variety of themes however our group lately works at the interface of affective dimensions in chemistry education research. We develop and apply diagnostic tests and in depth surveys to gather quantitative data with the aim of understanding how learning complex chemistry topics is governed by the affective variables.

Join

New ideas on joint research proposals and publications are welcome. We are eager to meet and collaborate with new researchers and research groups in the chemistry education domain.

Publishers

We are always eager to publish our studies to reach out wider community across the globe. We would be happy to talk with the publishers in the field for our research outlet.

Students

If you are in need of an external committee member for your Master's or doctoral research study, our group would be interested in discussing future possibilities.

Our group is interested in new members of undergraduate students, who are interested in chemistry education research. Learning chemistry is always exciting. Likewise, researching how different people learn chemistry is very exciting as well.

Sincerely,

Murat Kahveci, *on behalf of the Kahveci Group*

Projects Overview

Summary: This page presents the list of projects. More details for each project can be found by following the link sign at the end. Alternatively, the navigation menu on the top has these titles.

- Affective states and online teaching in chemistry education
    - 2020 - Present
    - PI: Kahveci M. Researcher: Muten Y
- Alternative assessment method in biochemistry education: Graphical representation of oxygen binding and delivery
    - 2017 - 2018
    - Co-PIs: Kahveci M, Jin L
- Integrating learning objects into D2L to promote student learning of difficult scientific concepts
    - 2017 - 2018
    - Co-PIs: Kahveci M, French T
- Impact of instructional interactivity in chemistry education
    - 2015 - 2016
    - PI: Kahveci M
- Workshop for in-service science teachers
    - January 2014
    - Chemistry Advisor: Kahveci M
- Pedagogical discontentment and self-efficacy of science teachers
    - 2013 - 2015
    - Senior Research Fellows: Kahveci M, Kahveci A, Mansour N, Alarfaj MM
- Physical chemistry education and learning objects
    - 2012 - 2014
    - PI: Kahveci M
- Applying research on science materials implementation: Bringing measurement of fidelity of implementation (FOI) to scale
    - 2007 - 2008
    - Senior Researcher and Evaluation Associate: Kahveci M. (PI: Jeanne Century, Co-PI: Andy Isaacs)
- EcoVentures: Focus on the Gulf

- 2000 - 2001
- External Evaluator: Kahveci M (PI: George Dawson)

Affective states and online teaching in chemistry education

Summary: This project has just initiated and is currently at the literature review phase. Further details will be announced in this page.

Project Publications

Journal Articles

1. Muten Y, & Kahveci M. (working). Dominant modalities of remote learning in chemistry education.

Project Information

Position

PI: Kahveci M. Researcher: Muten Y

Duration

2020 - Present (active participation)

Host Institution

Depaul University

Alternative assessment method in biochemistry education: Graphical representation of oxygen binding and delivery

Summary: Conceptual understanding is one of the essential levels of understanding in biochemistry. Some topics in biochemistry also require students to use complex graphical representations and mathematical knowledge to understand concepts and explain physiological phenomena. This project focuses on how to measure students' conceptual understanding in the context of undergraduate biochemistry course at DePaul University.

Synopsis

The topic of oxygen binding to hemoglobin in the blood and its delivery from the lung to tissues is being assessed not only by asking direct information, which may eventually be answered by recalling and recognizing (i.e. rote learning), but also by asking students' reasoning behind their answers. This topic is difficult for students to learn. Students are expected to interpret how oxygen pressure determines the oxygen saturation level in hemoglobin; how to map out the saturation level at a given pressure thus the amount of oxygen delivered; how tissue acidity correlates with the level of carbon dioxide, and how changes in both as well as another modulator molecule affect the release of oxygen from hemoglobin to tissue thus its delivery from the lung to tissues and the adaptation of a person to high altitude.

Project Publications

Conference Papers

2. Kahveci M, & Jin L. (2018). *Measuring conceptual understanding on oxygen binding and delivery in a biochemistry course*. Paper presented at Biennial Conference on Chemical Education (BCCE). Notre Dame, IN, USA. July 29 – August 2, 2018.

1. Kahveci M, & Jin L. (2017). *Alternative assessment method in biochemistry education: Graphical representation of oxygen binding and delivery*. Paper presented at DePaul University Teaching and Learning Conference. Workshop. Chicago, IL, USA. May 5, 2017.

Project Information

Position

Co-PIs: Kahveci M, Jin L

Duration

2017 - 2018 (active participation)

Host Institution

DePaul University

Integrating learning objects into D2L to promote student learning of difficult scientific concepts

Summary: Advancements in computers, educational technologies, and broadband Internet bring new opportunities for chemistry educators and learners. This project will introduce a valid and reliable method to effectively develop and easily deploy learning objects (i.e. Sharable Content Object Reference Model (SCORM)) in context of physical chemistry (PChem) course at DePaul University.

Synopsis

The pedagogical method for developing the learning objects relies on Inquiry-Based Science Education (IBSE) principles (AAAS, 1993[1 (page 12)]; NRC, 2000[2 (page 12)]). The deployment platform for the learning objects is D2L , in the context of an upper-level chemistry course (CHE302, Quantum Chemistry) at DePaul University.

This project focuses on the development of a learning object dealing with the "particle in a box" (PIAB) model of quantum mechanics. This model, which is used to describe a quantum mechanical particle confined to a region in space, is often the first model students are introduced to in CHE302. In the co-requisite laboratory course (CHE303, Experimental Physical Chemistry I), the students perform a complementary experiment on a set of dye molecules, which can be modeled using the PIAB. Students collect and analyze an ultraviolet-visible light (UV-Vis) spectrum for each dye molecule in order to determine the wavelength of maximum absorbance. This wavelength, which depends on the length of the dye molecule, can be predicted using the PIAB model. As with any model, the PIAB is an idealized situation compared to those seen in real-life applications. This adds a further complication for students when trying to not only better understand the PIAB model, but also make sense of their experimental data.

We discuss the development of a learning object that focuses on the critical steps and conceptual underpinning of this experiment. Students would complete this "virtual experiment" before entering the laboratory. Students will be guided by the system as they walk through some predictive questions and simulations that will better prepare them to successfully perform this experiment. While learning objects are well-positioned to foster the strengthening of connections between the classroom and the laboratory, they are not limited to experimental applications. Their versatility in terms of context, structure, and design is a major advantage for students and instructors alike. The system not only walks the students through the activity but also grades their responses with feedback as they progress, which provides an out-of-classroom opportunity for student self-learning. By the end of this interactive session, attendees will better understand both the underlying educational framework and the design process of these learning objects. Attendees will also work through the PIAB learning object, gaining first-hand knowledge of the student experience regarding learning objects.

Project Publications

Conference Papers

1. Kahveci M, & French T. (2017). *Integrating learning objects into D2L to promote student learning of difficult scientific concepts*. Paper presented at DePaul University Teaching and Learning Conference. Chicago, IL, USA. May 5, 2017.

Project Information

Position

Co-PIs: Kahveci M, French T

Duration

2017 - 2018 (active participation)

Host Institution

Depaul University

1. AAAS. (1993). *Benchmarks for science literacy*. Washington, DC: American Association for the Advancement of Science. Retrieved from http://www.project2061.org/tools/benchol/bolintro.htm ↩ (page 11)

2. NRC. (2000). *Inquiry and the national science education standards*. Washington, DC: National Academy Press. ↩ (page 11)

Impact of instructional interactivity in chemistry education

Summary: IIICE Project aims to integrate student response systems (SRS) into undergraduate general chemistry courses. We are testing SRS on student learning of chemistry contents and tracking students' conceptions from an interactive learning perspective.

Project Publications

Conference Papers

1. Kahveci M. (2016). *Advancing chemistry education research: Dual-Process Theories, Learning Objects and Student Response Systems* (**Keynote Lecture**). Paper presented at the European Conference on Research in Chemical Education (ECRICE), Barcelona. September 7 – 10, 2016.

Project Information

Position

PI: Kahveci M

Duration

2015 - 2016 (active participation)

Host Institution

Çanakkale Onsekiz Mart University

Funding Institution

Scientific Research Programs (Grant No. SBA-2015-569)

Budget

€6,445

Workshop for in-service science teachers

Summary: This project involved secondary in-service science teachers, having the content areas of chemistry, physics, biology, and mathematics, to advance their practicals skill on project development in education as way of improved teaching practice. I served as Chemistry Advisor and worked with about 20 chemistry teachers during a week-long intensive workshop period.

Project Information

Position

Chemistry Advisor: Kahveci M

Duration

January 2014 (active participation)

Host Institution

Çanakkale Onsekiz Mart University

Funding Institution

TUBITAK

Budget

€19,607

Pedagogical discontentment and self-efficacy of science teachers

Summary: The Science Teachers' Pedagogical Discontentment (STPD) scale has formerly been developed in the United States and used since 2006. Based on the perceptions of selected teachers, the scale is deeply rooted in the cultural and national standards.

Synopsis

The Science Teachers' Pedagogical Discontentment (STPD) scale has formerly been developed in the United States and used since 2006. Based on the perceptions of selected teachers, the scale is deeply rooted in the cultural and national standards. Given these limitations, the measurement integrity of its scores has not yet been conclusively established internationally, such as in the Saudi Arabia context. The items of the scale are slightly tailored to make the instrument suitable in the specific context, such as with respect to country-based regulations, reforms, and everyday practices of science teachers and their professional development initiatives. Item-based descriptive statistics, the measure's factor structure as opposed to its former validity studies, and factor-based reliability scores are investigated in the present report. Thus, this study extends the validity and reliability measures of the instrument to the international scale and further confirms its appropriateness to measure teacher attitudes towards inquiry-based science education initiatives.

Project Publications

Journal Articles

2. Kahveci A, Kahveci M, Mansour N, & Alarfaj MM. (2018). Exploring science teachers' affective states: Pedagogical discontentment, self-efficacy, intentions to reform, and their relationships. *Research in Science Education, 48*(6), 1359–1386.

1. Kahveci M, Kahveci A, Mansour N, & Alarfaj M. (2016). Construct validity and reliability measures of scores from the Science Teachers' Pedagogical Discontentment (STPD) scale. *Eurasia Journal of Mathematics, Science & Technology Education, 12*(3), 549-558.

Conference Papers

1. Kahveci M, Kahveci A, Mansour N, & Alarfaj MM. (2015). *Construct validity and reliability measures of scores from the Science Teachers' Pedagogical Discontentment (STPD) Scale*. Paper presented at the National Association for Research in Science Teaching International Conference (NARST). Chicago, IL, USA. April 11 - 14, 2015.

Project Information

Position

Senior Research Fellows: Kahveci M, Kahveci A, Mansour N, Alarfaj MM

Duration

2013 - 2015 (active participation)

Host Institution

Exeter University and Çanakkale Onsekiz Mart University

Funding Institution

Excellence Center for Science and Mathematics Education, King Saud University

Budget

€6,000

Physical chemistry education and learning objects

Summary: PChemLO project aims at measuring students' alternative conceptions in the context of physical chemistry course, which is enriched by educational technology. Educational technology includes the development and integration of learning objects (i.e. SCORM packages).

Project Publications

Books

1. Kahveci M. (2015). *Majors' gender-based affective states toward learning physical chemistry*. In M Kahveci, & M Orgill (Eds.). *Affective dimensions in chemistry education* (pp. 297–318). Berlin Heidelberg: Springer-Verlag. doi: 10.1007/978-3-662-45085-7 .

Conference Papers

9. Kahveci M. (2015). *Affective factors and instructional interactivity in education*. Paper presented at the Association of Private Schools Society in Turkey. Kaya Plazzo Hotel, Antalya, Turkey. January 28 - 31, 2015.

8. Kahveci M. (2015). *Introduction to Moodle Learning Management System and use of learning objects*. Paper presented at the Association of Private Schools Society in Turkey. [Workshop]. Kaya Plazzo Hotel, Antalya, Turkey. January 28 - 31, 2015.

7. Kahveci M. (2014). *Affective dimensions in chemistry education: Focus on educational technology and learning objects*. Paper presented at the Biennial Conference on Chemical Education (BCCE). [Symposium]. Grand Valley State University, Allendale, MI, U.S.A. Au- gust 3 - 7, 2014.

6. Kahveci M. (2013). *Phase diagrams and conceptual learning*. Paper presented at the National Chemistry Education Conference (UKEK). Karadeniz Technical University, Trabzon, Turkey. September 5 - 7, 2013.

5. Kahveci M. (2013). *Adaptation of learning objects to inquiry-based chemical education: Phase diagrams*. Paper presented at the National Chemistry Education Conference (UKEK). Karadeniz Technical University, Trabzon, Turkey. September 5 - 7, 2013.

4. Kahveci M. (2012). *Affective dimensions in chemistry education*. Paper presented at the Biennial Conference on Chemical Education (BCCE). [Symposium]. Pennsylvania State University, University Park, PA, USA. July 29 - August 2, 2012.

3. Kahveci M. (2012). *Physical chemistry education and learning objects (PChemLO): Affective aspects of implementation*. Paper presented at the Biennial Conference on Chemical Education (BCCE). Pennsylvania State University, University Park, PA, USA. July 29 - August 2, 2012.

2. Kahveci M. (2012). *Physical chemistry education and learning objects (PChemLO): A technological implementation to foster inquiry-based learning and diminish gender differences at higher education*. Paper presented at the 21st Symposium on Chemical and Science Education. [Poster]. TU Dortmund University, Dortmund, Germany. May 17-19, 2012.

1. Kahveci M. (2012). *Affective dimensions in chemistry education: Much left for future research*. Paper presented at the Biennial Conference on Chemical Education (BCCE). Pennsylvania State University, University Park, PA, USA. July 29 - August 2, 2012.

Project Information

Position

PI: Kahveci M

Duration

2012 - 2014 (active participation)

Host Institution

Çanakkale Onsekiz Mart University

Funding Institution

Scientific Research Programs (Grant No. 2011/132)

Budget

€6,000

Applying research on science materials implementation: Bringing measurement of fidelity of implementation (FOI) to scale

Summary: This is a project for instructional materials development based on applied research and is a three-year study of the implementation of NSF-supported science instructional materials in Chicago. The project seeks to scale up studies of fidelity of implementation. It produces a suite of instruments accompanied by a User's Guide for future research. The project identifies "critical components" of the curricula being studied and "fidelity criteria" to determine the extent to which those components are present with fidelity in instruction. After field-test, the instruments are used in 90 Chicago Public Schools. Data analysis defines "typologies" of implementation and explores the relationship between those typologies and student achievement. The project also explores uses of the instruments for mathematics and in other settings.

Project Publications

Conference Papers

2. Century J, Rudnick M, Freeman C, Isaacas A, Leslie D, & Kahveci M. (2008). *A conceptual framework for fidelity of implementation of instructional materials*. Paper presented at the American Educational Research Association (AERA). New York, USA. March 24 - 28, 2008.

1. Century J, Rudnick M, Freeman C, Leslie D, Kahveci M, & Isaacs A. (2008). *A framework for measuring fidelity of implementation of science instructional materials*. Paper presented at the National Association for Research in Science Teaching (NARST). Baltimore, USA. March 30 - April 2, 2008.

Project Information

Position

Senior Researcher and Evaluation Associate: Kahveci M. (PI: Jeanne Century, Co-PI: Andy Isaacs)

Duration

2007 - 2008 (active participation)

Host Institution

University of Chicago

Funding Institution

National Science Foundation (Award No. 0628052)

Budget

$1,000,000

EcoVentures: Focus on the Gulf

Summary: EcoVentures: Focus on the Gulf is a multimedia CD designed to help middle school students learn about the Gulf of Mexico's aquatic environment and the issues associated with protecting and managing aquatic resources. Students enter the world of a fictional National Park to explore a variety of ecosystems and develop a management plan for the park. There are on-line activities, expert consultants, and a video encyclopedia.

Project Publications

Books

1. Kahveci M. (2001). *The summative evaluation of the EcoVentures program in terms of its interactivity component*. Master's thesis, Florida State University, Tallahassee, Florida, USA.

Conference Papers

1. Kahveci M. (2000). *An on-line evaluation system for curriculum materials development*. Paper presented at the International Conference on College Teaching & Learning. Jacksonville, Florida, USA. April 12 - 15, 2000.

Project Information

Position

External Evaluator: Kahveci M (PI: George Dawson)

Duration

2000 - 2001 (active participation)

Host Institution

Florida State University

Funding Institution

National Science Foundation

Budget

$1,000,000

Publications Overview

Summary: This page presents the list of publication categories. More details for each category can be found by following the link sign at the end. Alternatively, the navigation menu on the left has these titles.

Publication Categories

- Books
    - *Latest:* Kahveci M, & Orgill MK. (Eds.). (2015). *Affective dimensions in chemistry education*. Berlin Heidelberg: Springer-Verlag. doi: 10.1007/978-3-662-45085-7 .
- Journal Articles
    - *Latest:* Muten Y, & Kahveci M. (working). Dominant modalities of remote learning in chemistry education.
- Conference Papers
    - *Latest:* Kahveci M, & Jin L. (2018). *Measuring conceptual understanding on oxygen binding and delivery in a biochemistry course*. Paper presented at Biennial Conference on Chemical Education (BCCE). Notre Dame, IN, USA. July 29 – August 2, 2018.
- Blog Posts
    - *Latest:* Installing a Learning Object to the D2L Environment

Books Overview

Summary: This page presents the list of publications categorized as Books. More details for each publication can be found by following the link sign at the end. Alternatively, the navigation menu on the left has these categories, folded with respective titles.

6. Kahveci M, & Orgill MK. (Eds.). (2015). *Affective dimensions in chemistry education*. Berlin Heidelberg: Springer-Verlag. doi: 10.1007/978-3-662-45085-7 .

5. Kahveci M. (2015). *Majors' gender-based affective states toward learning physical chemistry*. In M Kahveci, & M Orgill (Eds.). *Affective dimensions in chemistry education* (pp. 297–318). Berlin Heidelberg: Springer-Verlag. doi: 10.1007/978-3-662-45085-7 .

4. Kahveci M. (2009). *Shared perceptions of professors about instructional interactivity*. Saarbrücken: VDM Verlag Dr. Müller.

3. Kahveci M. (2005). *The perceptions of professors at colleges of education about instructional interactivity*. Doctoral dissertation, Florida State University, Tallahassee, Florida, USA.

2. Kahveci M. (2003). *Microdevice fabrication by softlithography and nonlinear phenomena in microchannels*. Master's thesis, Florida State University, Tallahassee, Florida, USA.

1. Kahveci M. (2001). *The summative evaluation of the EcoVentures program in terms of its interactivity component*. Master's thesis, Florida State University, Tallahassee, Florida, USA.

Journal Articles Overview

Summary: This page presents the list of publications categorized as Journal Papers. More details for each publication can be found by following the link sign at the end. Alternatively, the navigation menu on the left has these categories, folded with respective titles.

11. Muten Y, & Kahveci M. (working). Dominant modalities of remote learning in chemistry education.

10. Kahveci A, Kahveci M, Mansour N, & Alarfaj MM. (2018). Exploring science teachers' affective states: Pedagogical discontentment, self-efficacy, intentions to reform, and their relationships. *Research in Science Education, 48*(6), 1359–1386.

9. Kahveci M, Kahveci A, Mansour N, & Alarfaj M. (2016). Construct validity and reliability measures of scores from the Science Teachers' Pedagogical Discontentment (STPD) scale. *Eurasia Journal of Mathematics, Science & Technology Education, 12*(3), 549-558.

8. Kahveci M, & Imamoglu Y. (2014). Re-analysis of PISA 2003 data about students' mathematics anxiety, self-efficacy, and motivation. *Journal of Research in Education and Society, 1*(1), 1-22.

7. Kahveci M, & Imamoglu Y. (2014). Use of technology and attitudes towards technology: An international analysis of the PISA 2003 data. *Journal of Research in Education and Society, 1*(1), 45-63.

6. Southerland SA, Saka Y, Nadelson L, Kahveci M, Sowell S, & Granger EM. (2012). Measuring one aspect of teachers' affective states: Development of the science teachers' pedagogical discontentment scale. *School Science and Mathematics, 112*(8), 483-494.

5. Kahveci M. (2010). Students' perceptions to use technology for learning: Measurement integrity of the modified Fennema-Sherman attitudes scales. *Turkish Online Journal of Educational Technology, 9*(1), 185- 201.

4. Kahveci M. (2007). An instrument development: Interactivity Survey (IS). *Journal of Educational Technology & Society, 10*(3), 163-174.

3. Kahveci M, & Imamoglu Y. (2007). Interactive learning in mathematics education: Review of recent literature. *Journal of Computers in Mathematics and Science Teaching, 26*(2), 137-153.

2. Kahveci M. (2006). Instructional interactivity endeavor and Spiral Dynamics. *Bogazici University Journal of Education, 20*(1), 11-24.

1. Ginn BT, Steinbock B, Kahveci M, & Steinbock O. (2004). Microfluidic devices for the Belousov-Zhabotinsky reaction. *Journal of Physical Chemistry A, 108*, 1325-1332.

Conference Papers Overview

Summary: This page presents the list of publications categorized as Conference Papers. More details for each publication can be found by following the link sign at the end. Alternatively, the navigation menu on the left has these categories, folded with respective titles.

43. Kahveci M, & Jin L. (2018). *Measuring conceptual understanding on oxygen binding and delivery in a biochemistry course*. Paper presented at Biennial Conference on Chemical Education (BCCE). Notre Dame, IN, USA. July 29 – August 2, 2018.

42. Kahveci M, & French T. (2017). *Integrating learning objects into D2L to promote student learning of difficult scientific concepts*. Paper presented at DePaul University Teaching and Learning Conference. Chicago, IL, USA. May 5, 2017.

41. Kahveci M, & Jin L. (2017). *Alternative assessment method in biochemistry education: Graphical representation of oxygen binding and delivery*. Paper presented at DePaul University Teaching and Learning Conference. Workshop. Chicago, IL, USA. May 5, 2017.

40. Kahveci M. (2016). *Advancing chemistry education research: Dual-Process Theories, Learning Objects and Student Response Systems* (**Keynote Lecture**). Paper presented at the European Conference on Research in Chemical Education (ECRICE), Barcelona. September 7 – 10, 2016.

39. Kahveci M. (2015). *A project idea on working definition of IBSE in Europe through artificial intelligence*. Paper presented at the European Commission and SiS.net. (Brokerage Event). Brussels, Belgium. May 22, 2015.

38. Kahveci M. (2015). *A project idea on working definition of IBSE in Europe through artificial intelligence*. Paper presented at the IOSTE Eurasian Regional Symposium and Brokerage Event Horizon 2020, Istanbul, Turkey. April 24 – 26, 2015.

37. Kahveci M, Kahveci A, Mansour N, & Alarfaj MM. (2015). *Construct validity and reliability measures of scores from the Science Teachers' Pedagogical Discontentment (STPD) Scale*. Paper presented at the National Association for Research in Science Teaching International Conference (NARST). Chicago, IL, USA. April 11 - 14, 2015.

36. Kahveci M. (2015). *Affective factors and instructional interactivity in education*. Paper presented at the Association of Private Schools Society in Turkey. Kaya Plazzo Hotel, Antalya, Turkey. January 28 - 31, 2015.

35. Kahveci M. (2015). *Introduction to Moodle Learning Management System and use of learning objects*. Paper presented at the Association of Private Schools Society in Turkey. [Workshop]. Kaya Plazzo Hotel, Antalya, Turkey. January 28 - 31, 2015.

34. Kahveci M. (2015). *An account for Inquiry-Based Science Education through Dual-Process Theories*. Paper presented at European Science Education Research Association (ESERA). Helsinki, Finland. August 31 - September 4, 2015.

33. Kahveci M. (2014). *Affective dimensions in chemistry education: Focus on educational technology and learning objects*. Paper presented at the Biennial Conference on Chemical Education (BCCE). [Symposium]. Grand Valley State University, Allendale, MI, U.S.A. Au- gust 3 - 7, 2014.

32. Kahveci M. (2013). *Phase diagrams and conceptual learning*. Paper presented at the National Chemistry Education Conference (UKEK). Karadeniz Technical University, Trabzon, Turkey. September 5 - 7, 2013.

31. Kahveci M. (2013). *Preparing a grant proposal for funding by the European Commission and presenting a grant proposal in chemistry education*. Paper presented at the National Chemistry Education Conference (UKEK). [Workshop]. Karadeniz Technical University, Trabzon, Turkey. September 5 - 7, 2013.

30. Kahveci M. (2013). *Experiences in reviewing proposals under FP7 Program and some tips for improving proposals*. Paper presented at the CARPE Conference. Manchester Metropolitan University, Manchester, UK. November 4 - 6, 2013.

29. Kahveci M. (2013). *Adaptation of learning objects to inquiry-based chemical education: Phase diagrams*. Paper presented at the National Chemistry Education Conference (UKEK). Karadeniz Technical University, Trabzon, Turkey. September 5 - 7, 2013.

28. Kahveci M. (2012). *Affective dimensions in chemistry education*. Paper presented at the Biennial Conference on Chemical Education (BCCE). [Symposium]. Pennsylvania State University, University Park, PA, USA. July 29 - August 2, 2012.

27. Kahveci M. (2012). *Physical chemistry education and learning objects (PChemLO): Affective aspects of implementation*. Paper presented at the Biennial Conference on Chemical Education (BCCE). Pennsylvania State University, University Park, PA, USA. July 29 - August 2, 2012.

26. Kahveci M. (2012). *Physical chemistry education and learning objects (PChemLO): A technological implementation to foster inquiry-based learning and diminish gender differences at higher education*. Paper presented at the 21st Symposium on Chemical and Science Education. [Poster]. TU Dortmund University, Dortmund, Germany. May 17-19, 2012.

25. Kahveci M. (2012). *Affective dimensions in chemistry education: Much left for future research*. Paper presented at the Biennial Conference on Chemical Education (BCCE). Pennsylvania State University, University Park, PA, USA. July 29 - August 2, 2012.

24. Kegler A, Kahveci M, & Kremer K. (2012). *Einstellungen zur Chemie und zum Chemielernen bei türkischen und deutschen Jugendlichen*. Paper presented at the Jahrestagung der Gesellschaft für Didaktik der Chemie und Physik (GDCP). [Poster]. Leibniz- Universität, Hannover, Germany. September 17 - 20, 2012.

23. Kahveci M. (2011). *Depicting chemistry majors' self-perceptions in learning chemistry*. Paper presented at the National Association for Research in Science Teaching (NARST). Orlando, FL, USA. April 3 - 6, 2011.

22. Kahveci M. 2009. *FP7 Science in Society Program: The evaluation process of large scale proposals for coordination and support actions*. Paper presented at the International Conference of Educational Research Association Turkey (EAB). Canakkale, Turkey. May 1 - 3, 2009.

21. Kahveci M. 2009. *Quantifying high school students' self- perceptions in learning chemistry*. Paper presented at the National Association for Research in Science Teaching (NARST). Garden Grove, CA, USA. April 17 - 21, 2009.

20. Kahveci M. (2009). *Analysis of Turkish high-school chemistry examination questions according to Bloom's Taxonomy*. Paper presented at the International Conference of Educational Research Association Turkey (EAB). Canakkale, Turkey. May 1 - 3, 2009.

19. Kahveci M, Coskun S, & Taylan RD. (2008). *Students' motivation to use technology for learning*. Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications (ED-MEDIA). Vienna, Austria. June 30 - July 4, 2008.

18. Century J, Rudnick M, Freeman C, Isaacas A, Leslie D, & Kahveci M. (2008). *A conceptual framework for fidelity of implementation of instructional materials*. Paper presented at the American Educational Research Association (AERA). New York, USA. March 24 - 28, 2008.

17. Century J, Rudnick M, Freeman C, Leslie D, Kahveci M, & Isaacs A. (2008). *A framework for measuring fidelity of implementation of science instructional materials*. Paper presented at the National Association for Research in Science Teaching (NARST). Baltimore, USA. March 30 - April 2, 2008.

16. Kahveci M. (2007). *Investigating the existence of interactivity in various instructional settings*. Paper presented at the National Association for Research in Science Teaching (NARST). New Orleans, USA. April 15 - 18, 2007.

15. Southerland SA, Sowell S, Kahveci M, Granger EM, & Saka, Y. (2007). *A finer grain understanding of teachers' adoption of reforms?: Development of an instrument to assess science teachers' pedagogical discontentment (STPD)*. Paper presented at the National Association for Research in Science Teaching (NARST). New Orleans, USA. April 15 - 18, 2007.

14. Kahveci, M. & Imamoglu, Y. (2007). Interactive Learning in Mathematics Education: Review of Recent Literature. In R. Carlsen, K. McFerrin, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of SITE 2007–Society for Information Technology & Teacher Education International Conference* (pp. 3269-3276). San Antonio, Texas, USA: Association for the Advancement of Computing in Education (AACE). Retrieved August 30, 2020 from https://www.learntechlib.org/primary/p/25115/ .

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Blog

This year's posts

- 13 Aug Installing a Learning Object to the D2L Environment
- 05 Aug Request for Letter of Recommendation
- 03 Jun 'Thank you' from Andres
- 13 Apr D2L Submission Folder Setup with a Rubric
- 11 Apr Tools
- 11 Apr Low Cost Options for Document Cameras
- 06 Apr Deferments or Cancellations of Events due to COVID-19
- 05 Apr Forums in D2L
- 24 Mar 'Chemistry' from Madison
- 19 Mar I Will Survive, Coronavirus version of teachers going online

2019

- 08 Sep Higher Education in Science and Engineering
- 07 Sep Affective Dimensions in Chemistry Education

2018

- 30 Dec New paper published by RISE
- 15 Dec Critical Chemistry
- 14 Dec Connected Science Learning
- 05 Aug BCCE 2018

Affective dimensions in chemistry education

Summary: The inspiration for this book was the organization of a symposium entitled Affective Dimensions in Chemistry Education for the 2012 Biennial Conference on Chemical Education held at The Pennsylvania State University. The main purpose of that symposium—and of this volume—was to gather the most up-to-date expertise and research about the influence of the affective domain on learning in chemistry into one location. We hope that this book will serve as a resource for those wishing to address the affective domain as they research and solve problems in chemistry education.

🐾 Kahveci M, Orgill MK. (Eds.). (2015). Berlin Heidelberg: Springer-Verlag.

About half a century ago, Bloom et al. (1956, 1964) published two handbooks outlining a taxonomy of educational objectives. In their conceptualization—which is not specific to chemistry education, but relates to education in general—educational objectives could be categorized into three major domains: cognitive, affective, and psychomotor. Of these three, the cognitive domain has received significantly more attention by researchers over the years, especially in the context of chemistry learning. With this volume, we intended to gather information about the influence of the affective domain on chemistry learning in order to inspire consideration of the affective domain both in the context of chemistry teaching and in the context of future chemistry education research.

Affective dimensions refer to such psychological constructs as attitudes, values, beliefs, opinions, emotions, interests, motivation, and a degree of acceptance or rejection (Koballa, 2013; Krathwohl, Bloom, & Masia, 1964). For several reasons, these dimensions have often been ignored or minimized in science education research literature, in curriculum development, and in assessment. First, it is challenging to measure affective constructs—such as students' motivation to learn science, their attitudes about learning science, and the degree to which they value scientific knowledge and practices—as these are hard to observe. Additionally, in practice, if a teacher explicitly states specific affective objectives in the classroom, some students will do everything they can to reflect those objectives, as they know that they will get credit for those valued behaviors. In such a case, students' demonstrated behaviors might not reveal their true attitudes and beliefs toward learning science. Second, many practicing scientists attempt to divorce the affective domain—subjectivity and individuals' feelings—from the cognitive domain, which is believed (by the scientists) to be more reason driven and objective. As a consequence, science is often presented in classrooms as being objective and separate from attitudes, values, beliefs, opinions, and emotions. Finally, because it is perceived to be more challenging to measure outcomes in the affective domain than in the cognitive domain, our current educational systems around the world tend to focus assessments on cognitive, instead of affective, objectives.

So, *what is the status quo*? How is the current emphasis on cognitive objectives and the lack of emphasis on affective objectives influencing student interest in and retention in science fields? The drawbacks of our current educational practices were clearly observed in recent international studies like PISA (Programme for International Student Assessment) and described in a European Union document known as the "Rocard Report" (Rocard et al., 2007). According to this report, the following issues were highlighted:

- The number of young people entering universities is increasing, but they are choosing to study fields other than science; in consequence, the proportion of young people studying science is decreasing (e.g., In 2003, the total physical science graduates in the USA dropped by 12 % (about 88,000) in comparison to 1995 (about 100,000); the same comparison for Germany is even more dramatic—50,000 vs. 101,000—a 50 % loss).

- When looked at from a gender perspective, the problem is even worse as, in general, females are less interested in science education than males (e.g., females comprised only 31.2 % of the MST [mathematics, science, and technology] graduates in EU27 countries and only 31.1 % of MST graduates in the USA in 2005).

The current situation urges us to reconsider our current approaches to science education in general and to chemistry education in particular. Because positive affective dimensions have been shown to correlate with students' persistence and performance in science topics, a focus on affective dimensions is an important part of the solution to the global issues of lack of interest and retention in science education in general (and chemistry education in specific).

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Citation

Kahveci M, & Orgill MK. (Eds.). (2015). *Affective dimensions in chemistry education*. Berlin Heidelberg: Springer-Verlag. doi: 10.1007/978-3-662-45085-7 .

Majors' gender-based affective states toward learning physical chemistry

Summary: This study examines the affective states of students who are chemistry majors at the junior and senior levels, in the context of a Physical Chemistry II (PChem II) course.

Kahveci M. (2015). Berlin Heidelberg: Springer-Verlag.

The study relies on students' self-reflections while they respond to an online survey system. The online survey includes three sections: demographics, Reformed Teaching Observation Protocol (RTOP), and Modified Fennema-Sherman Mathematics Attitudes Scales (mFSMAS). The RTOP instrument is used by the students to describe the teaching in the PChem II class. The mFSMAS was chosen to measure attitudes from the gender differences point of view. Internal consistency analyses indicate that the instruments are reliable. The findings reveal that females do not perceive themselves as being disadvantaged when it comes to learning PChem II topics. The same conclusion is valid for their male counterparts. In addition, RTOP, as rated by students, describes the nature of the PChem II as traditional, lecture-based instruction. A significant correlation coefficient between the composite scores of RTOP and mFSMAS indicates that the use of inquiry-based teaching strategies correlates to positive student affective states toward learning physical chemistry. Accordingly, in the case of the specific PChem II course examined in this study, the dominance of lecturing led to low to moderate positive attitudes toward the course.

Citation

Kahveci M. (2015). *Majors' gender-based affective states toward learning physical chemistry*. In M Kahveci, & M Orgill (Eds.). *Affective dimensions in chemistry education* (pp. 297–318). Berlin Heidelberg: Springer-Verlag. doi: 10.1007/978-3-662-45085-7 .

Shared perceptions of professors about instructional interactivity

Summary: Research in education indicates that there is not a settled view of what interactivity or interaction mean for learning and instruction.

Kahveci M. (2009). Saarbrücken: VDM Verlag Dr. Müller.

This book presents the research procedures and findings on the perceptions of the faculty members at colleges of education around the world about instructional interactivity, by specifically undertaking a comparative analysis of the key aspects surrounding the functional definitions of interactivity, the existence of interactivity in various instructional settings, the attributes of interactivity as a function of motivation and learning theories, and the events of interactivity to discern any relationships that might exist with respect to the eight predictors; gender, age, present status, highest degree obtained, geographic region, research interest in interactivity, personal learning preferences (the strength of the VARK score), and institutional department. This work included educational measurement in the form of valid and reliable instrument development, literature from many fields of education such as educational technology, educational measurement, psychology, science and mathematics education.

Citation

Kahveci M. (2009). *Shared perceptions of professors about instructional interactivity*. Saarbrücken: VDM Verlag Dr. Müller.

The perceptions of professors at colleges of education about instructional interactivity

Summary: This research investigated the perceptions of the faculty members at colleges of education around the world about instructional interactivity by specifically undertaking a comparative analysis of the key aspects surrounding the functional definitions of interactivity, the existence of interactivity in various instructional settings, the attributes of interactivity as a function of motivation and learning theories, and the events of interactivity to discern any relationships that might exist with respect to the eight predictors; gender, age, present status, highest degree obtained, geographic region, research interest in interactivity, personal learning preferences (the strength of the VARK score), and department.

Kahveci M. (2005). Florida State University.

The study was based on an online survey investigating instructional interactivity. The content and reliability analyses of the survey instrument indicated high degree of internal consistency and validity among the items. Two-thousand-seven-hundred-fifty-two of 14792 faculty members completed the survey, for a response rate of 18.1%. Findings indicated that the faculty members perceived all presented instructional events in various settings from moderately high to high interactivity. In addition, the perceptions of faculty members about instructional interactivity varied with their personal characteristics that were mentioned above as predictors. This result indicated that interactivity was context dependent, stemming from various factors. Also, the ratings of faculty members strongly associated interactivity with learning theory (Conditions of Learning) and motivation (ARCS Model). This study is important since at present there is no settled view of what interactivity and interaction mean in education context and owing to this fact information available in the literature on research into the complex phenomenon of interactivity and interaction is rather limited. And, despite this limitation, interactivity and interaction are attributed to be critical in promoting and enhancing effective learning.

Citation

Kahveci M. (2005). *The perceptions of professors at colleges of education about instructional interactivity*. Doctoral dissertation, Florida State University, Tallahassee, Florida, USA.

Microdevice fabrication by softlithography and nonlinear phenomena in microchannels

Summary: This study presents a methodology to fabricate micro-fluidic devices by a soft-lithography technique. The micro-fluidic system is then used as a reactor for the Belousov-Zhabotinsky (BZ) reaction to investigate the front dynamics of chemical waves propagating in microchannels and curvatures.

Kahveci M. (2003). Florida State University.

The fabrication of micro-fluidic devices by a soft-lithography technique was introduced in this study. This technique allows one to photographically print micropatterns on polished silicon wafer surface in high precision along with great reproducibility. The pattern for the device is a production of pictorial images by a computer. The micropattern on the silicon surface is called as positive replica (hill). The patterned silicon wafer is used to cast poly-(dimethylsiloxane) (PDMS) polymer, giving rise to negative replica (valley) on the PDMS surface. Because the fabrication is inexpensive and technologically feasible, this technique allows one to integrate micro-fluidic devices in various experimental designs.

The micro-fluidic system is then used as a reactor for the Belousov-Zhabotinsky (BZ) reaction. A modified version of CHD-BZ system was used throughout the investigations. The CHD-BZ system is excitable reaction-diffusion medium along with gas-free products. The investigation of the front dynamics revealed that velocity of the chemical waves differ in a range of inner diameter sizes of the microchannels in the PDMS polymer. Chemical waves have the same velocity, the same amplitude in the same concentrations of the initial species. That is, there is no expected such size dependence on front dynamics.

It is concluded that this property was caused by the bromine diffusion to the PDMS polymer. Bromine acts as an inhibitor for the CHD-BZ reaction. Due to high volume to surface ratio, the faster front velocities are observed in narrower channels. Finally, the measurement of the partition coefficient of bromine into the PDMS polymer is performed. Those measurements were carried out at various temperatures. As a result, high bromine migration from aqueous solution to the PDMS polymer was observed.

Citation

Kahveci M. (2003). *Microdevice fabrication by softlithography and nonlinear phenomena in microchannels*. Master’s thesis, Florida State University, Tallahassee, Florida, USA.

The summative evaluation of the EcoVentures program in terms of its interactivity component

Summary: This study focuses on the interactivity component of the EcoVentures program during instruction in middle and high school science classes.

Kahveci M. (2003). Florida State University.

Although the term “Interactivity” had been in use long before computer programs became a common feature of curriculum materials, little research has been done about the effectiveness of interactivity in education. It is believed that Interactivity increases learning in educational settings. This study focuses on the interactivity component of the EcoVentures program during instruction in middle and high school science classes. EcoVentures is a CD-I program targeting middle school students. For this study, on-line teacher and student surveys were conducted, interviews with teachers and students, and classroom observations were done. Teacher and student attitudes about the program are described. Forms of interactivity and effects on attitudes were investigated. The attitudes of the teachers and students revealed that both groups were positive towards the Interactivity component of the program. However, tenth grade students were prone to be less interested in the use of the program than eighth graders.

Citation

Kahveci M. (2001). *The summative evaluation of the EcoVentures program in terms of its interactivity component*. Master’s thesis, Florida State University, Tallahassee, Florida, USA.

Dominant modalities of remote learning in chemistry education

Work in progress.

Citation

Muten Y, & Kahveci M. (working). Dominant modalities of remote learning in chemistry education.

Exploring science teachers' affective states: Pedagogical discontentment, self-efficacy, intentions to reform, and their relationships

Summary: Teachers play a key role in moving reform-based science education practices into the classroom. Based on research that emphasizes the importance of teachers' affective states, this study aimed to explore the constructs pedagogical discontentment, science teaching self-efficacy, intentions to reform, and their correlations. Also, it aimed to provide empirical evidence in light of a previously proposed theoretical model while focusing on an entirely new context in Middle East.

Kahveci A, Kahveci M, Mansour N, Alarfaj MM. (2018). Research in Science Education.

Data were collected in Saudi Arabia with a total of randomly selected 994 science teachers, 656 of whom were females and 338 were males. To collect the data, the Arabic versions of the Science Teachers' Pedagogical Discontentment scale, the Science Teaching Efficacy Beliefs Instrument and the Intentions to Reform Science Teaching scale were developed. For assuring the validity of the instruments in a non-Western context, rigorous cross-cultural validations procedures were followed. Factor analyses were conducted for construct validation and descriptive statistical analyses were performed including frequency distributions and normality checks. Univariate analyses of variance were run to explore statistically significant differences between groups of teachers. Cross-tabulation and correlation analyses were conducted to explore relationships. The findings suggest effect of teacher characteristics such as age and professional development program attendance on the affective states. The results demonstrate that teachers who attended a relatively higher number of programs had lower level of intentions to reform raising issues regarding the conduct and outcomes of professional development. Some of the findings concerning interrelationships among the three constructs challenge and serve to expand the previously proposed theoretical model.

Citation

Kahveci A, Kahveci M, Mansour N, & Alarfaj MM. (2018). Exploring science teachers' affective states: Pedagogical discontentment, self-efficacy, intentions to reform, and their relationships. *Research in Science Education, 48*(6), 1359–1386.

Construct validity and reliability measures of scores from the Science Teachers' Pedagogical Discontentment (STPD) scale

Summary: The Science Teachers' Pedagogical Discontentment (STPD) scale has formerly been developed in the United States and used since 2006. Based on the perceptions of selected teachers, the scale is deeply rooted in the cultural and national standards.

Kahveci M, Kahveci A, Mansour N, Alarfaj MM. (2016). Eurasia Journal of Mathematics, Science & Technology Education.

Given these limitations, the measurement integrity of its scores has not yet been conclusively established internationally, such as in the Saudi Arabia context. The items of the scale are slightly tailored to make the instrument suitable in the specific context, such as with respect to country-based regulations, reforms, and everyday practices of science teachers and their professional development initiatives. Item-based descriptive statistics, the measure's factor structure as opposed to its former validity studies, and factor-based reliability scores are investigated in the present report. Thus, this study extends the validity and reliability measures of the instrument to the international scale and further confirms its appropriateness to measure teacher attitudes towards inquiry- based science education initiatives.

Citation

Kahveci M, Kahveci A, Mansour N, & Alarfaj M. (2016). Construct validity and reliability measures of scores from the Science Teachers' Pedagogical Discontentment (STPD) scale. *Eurasia Journal of Mathematics, Science & Technology Education, 12*(3), 549-558.

Use of technology and attitudes towards technology: An international analysis of the PISA 2003 data

Summary: The aim of this study is to analyze the use of computers and attitudes towards computers with respect to gender, geographical regions and socioeconomic status.

Kahveci M, Imamoglu Y. (2014). Journal of Research in Education and Society.

The sample includes 15-year old students, who have participated in the international PISA 2003 study. Significant differences are found in the variables of availability of a computer to use, experience of computer use, frequency of computer use for different purposes, and attitudes towards computers. Connections with mathematics anxiety are also discussed. Results indicate that boys have more positive attitude towards computers and they tend to use computers more frequently. While socioeconomic level increases, experiences in computer use and Internet use and positive attitudes towards computers increase.

Citation

Kahveci M, & Imamoglu Y. (2014). Use of technology and attitudes towards technology: An international analysis of the PISA 2003 data. *Journal of Research in Education and Society, 1*(1), 45-63.

Re-analysis of PISA 2003 data about students' mathematics anxiety, self-efficacy, and motivation

Summary: Relying on PISA 2003 data, the study investigated students' anxiety, motivation, self-efficacy, and self-concept on learning mathematics. The analysis was carried out over large amount of data, collected from 272,138 students who were 15-16 year-old of age groups, coming from 41 countries.

Kahveci M, Imamoglu Y. (2014). Journal of Research in Education and Society.

Two-stage stratified sampling strategy provided the sample for the analysis. Findings showed that

- boys have significantly higher mathematical self-efficacy, self-concept, motivation and lower mathematics anxiety than girls,
- students with higher socioeconomic status have higher self-efficacy, self-concept and motivation whereas students with the highest mathematics anxiety are in medium socioeconomic level, and
- self-efficacy, self-concept, motivation and anxiety differ significantly with respect to geographical regions.

Citation

Kahveci M, & Imamoglu Y. (2014). Re-analysis of PISA 2003 data about students' mathematics anxiety, self-efficacy, and motivation. *Journal of Research in Education and Society, 1*(1), 1-22.

Measuring one aspect of teachers' affective states: Development of the science teachers' pedagogical discontentment scale

Summary: The aim of this research is to describe the development of the Science Teachers' Pedagogical Discontentment Scale, an instrument that measures the discontentment that arises in teachers as they recognize a mismatch between their own pedagogical beliefs and goals and their actual classroom practices.

Southerland SA, Saka Y, Nadelson L, Kahveci M, Sowell S, Granger EM. (2012). School Science and Mathematics.

From a conceptual change perspective, we explore the meaning of pedagogical discontentment and discuss its role in shaping teachers' receptivity to messages of reform. We present an instrument that can be used to measure teachers' pedagogical discontentment, an instrument that will allow science educators to better describe the affective states of teachers as they enter professional development experiences. The items for the initial instrument were derived from a series of interviews with practicing teachers; from these interviews, a group of 42 items were designed around a group of five subscales. The final instrument, revised after two rounds of field testing, includes 21 multiple-choice items clustered around six subscales (subscales derived from interviews with science teachers). The processes used to develop the items and to refine instrument are discussed. Uses for this instrument to inform professional development experiences are explored as well as implications.

Citation

Southerland SA, Saka Y, Nadelson L, Kahveci M, Sowell S, & Granger EM. (2012). Measuring one aspect of teachers' affective states: Development of the science teachers' pedagogical discontentment scale. *School Science and Mathematics, 112*(8), 483-494.

Students' perceptions to use technology for learning: Measurement integrity of the modified Fennema-Sherman attitudes scales

Summary: This study investigates high school students' motivation to use technology for learning by a comparative analysis with respect to varying personal characteristics such as gender, grade level, content area of interest (i.e. science and mathematics, mathematics and social science), and previous experience in using technology for learning.

🐾 Kahveci M. (2010). Turkish Online Journal of Educational Technology.

The purpose of this study was in two-fold:

1. to provide the evidence for the reliability of the modified Fennema-Sherman Mathematics Attitude Scales (FSMAS), as translated to Turkish language and transformed to the educational technology context, and
2. to investigate high school students' motivation to use technology for learning by a comparative analysis with respect to varying personal characteristics such as gender, grade level, content area of interest (i.e. science and mathematics, mathematics and social science), and previous experience in using technology for learning.

The modified version of FSMAS was administered to 9th-12th grade students at a gifted boarding high school in Istanbul, Turkey. The FSMAS instrument was highly reliable (Cronbach-α, from .942 to .777). The factor analysis showed that there were eight different thematic categories among the items.

Overall, findings indicated that students had positive attitudes towards the use of technology for learning, regardless of their various personal characteristics such as gender, age, grade level, previous experience, and content area of interest. In addition, students at lower grades tended to have more satisfaction in using technology compared to the higher graders. Interestingly, more experienced students were less confident in using technology compared to less experienced students. Although female students did not have a negative attitude towards the use computers for learning, they felt less confident in using technology compared to male students. Finally, students good at science and mathematics were more positive about their ability to use technology as compared to their social science counterparts.

Citation

Kahveci M. (2010). Students' perceptions to use technology for learning: Measurement integrity of the modified Fennema-Sherman attitudes scales. *Turkish Online Journal of Educational Technology, 9*(1), 185- 201.

Interactive learning in mathematics education: Review of recent literature

Summary: This review investigates the use of certain types of interaction in mathematics education. These types include interaction between students, interaction between teacher and students, and interaction between students and leaning technology.

Kahveci M, Imamoglu Y. (2007). Journal of Computers in Mathematics and Science Teaching.

Student-technology interactions are explained by computer programs that use problem-solving strategies and multiple representations. Interaction between teacher and students are explained in two categories, classroom interaction and small group interaction. Teachers need to consider many factors in order to establish a classroom environment to enhance the mathematical understanding of their students. In small cooperative groups, factors that effect interaction are as follows: group composition, type of interaction, effect of teacher, interdependence of students and nature of the task. We provide some teaching implications of the findings as follows: students should be encouraged to use multiple representations to develop problem solving strategies; students' motivation to learn should be mastery goal oriented, teachers should try to create contexts for mathematical argumentation; teachers should encourage student participation in classroom discussions; students should be expected to provide mathematical reasoning rather than producing the right answer; and design of tasks should be suitable to promote skills such as mathematical reasoning and metacognition.

Citation

Kahveci M, & Imamoglu Y. (2007). Interactive learning in mathematics education: Review of recent literature. *Journal of Computers in Mathematics and Science Teaching, 26*(2), 137-153.

An instrument development: Interactivity Survey (IS)

Summary: This paper presents the item-development stages and validity and reliability analysis of the Interactivity Survey (IS).

Kahveci M. (2007). Journal of Educational Technology & Society.

Although there is no agreement as to what instructional interactivity and interaction mean in educational literature, researchers agree that both terms are vital for teaching and learning one way or another. This paper presents the item-development stages and validity and reliability analysis of the Interactivity Survey (IS), which attempts to uncover the perceptions of professors working at departments of education from universities around the world. To provide evidence of reliability of the instrument, a pilot study was carried out with a sample size of 262 universities. All of the statistical test results and the final version of the instrument were provided. Thus, this paper is both a theoretical paper that conceptually synthesizes the literature on instructional interactivity and a technical paper that considers the information from an instrument-development point of view.

Citation

Kahveci M. (2007). An instrument development: Interactivity Survey (IS). *Journal of Educational Technology & Society, 10*(3), 163-174.

Instructional interactivity endeavor and Spiral Dynamics

Summary: This article discusses operational definitions and levels of interactivity on the basis of the education literature, particularly in the field of computer-based instruction, cognitive science, and science education.

Kahveci M. (2006). Bogazici University Journal of Education.

It is commonly accepted in most educational research communities that delivery of instruction accompanied by interactivity will increase learning and improve instruction in practice. This article discusses operational definitions and levels of interactivity on the basis of the education literature (particularly in the field of computer-based instruction, cognitive science, and science education). However, in the literature, definitions and forms of interactivity are often confined by instructional media, such as computer programs and telecommunications technologies. The Spiral Dynamics model can be considered in an attempt to base conceptual parameters for the operation of interactivity on terms of human psychology and ability of learning.

Citation

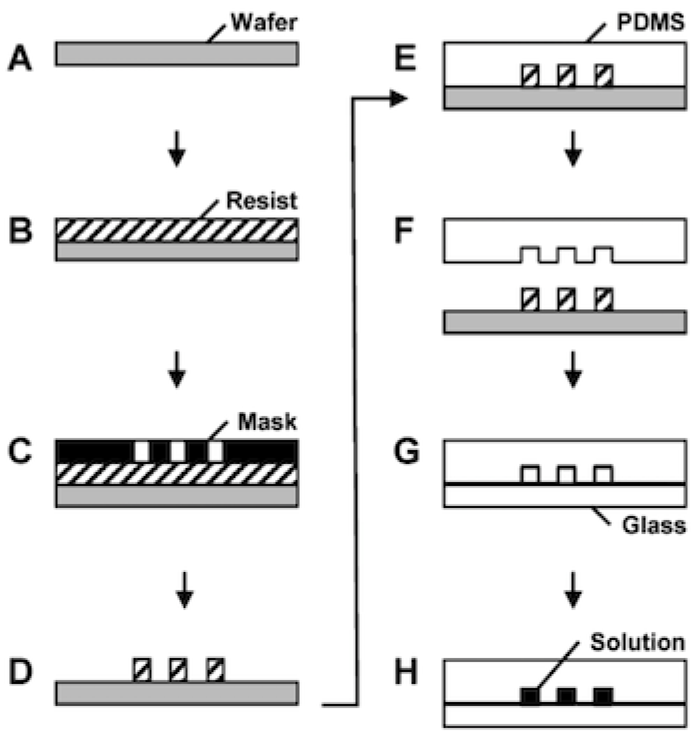
Kahveci M. (2006). Instructional interactivity endeavor and Spiral Dynamics. *Bogazici University Journal of Education, 20*(1), 11-24.

Microfluidic devices for the Belousov-Zhabotinsky reaction

Summary: We describe an experimental methodology for the study of chemical self-organization in micropatterned reaction systems.

Ginn BT, Steinbock B, Kahveci M, Steinbock O. (2004). Journal of Physical Chemistry A.

Our approach is based on office-printer-assisted soft lithography and allows the fabrication of centimeter-scale devices with reactor units as small as 50 μm. The devices are made from the elastomeric material poly(dimethylsiloxane) and are filled with a modified Belousov–Zhabotinsky solution. This excitable reaction–diffusion medium employs 1,4-cyclohexanedione as a bubble-free organic substrate and Fe(II)[batho(SO^3)^2]^3 as a high-absorbance redox catalyst/indicator. Chemical wave propagation is affected by the loss of bromine from the aqueous phase into the elastomer matrix. The strength of this activating process depends on the local surface-to-volume ratio and can increase the wave velocity by a factor of 2. For devices with gridlike reactor networks, we observe a pronounced deformation of target patterns and the pinning of spiral waves to single elastomer obstacles as well as to obstacle clusters.



A micropatterned reaction system.

Citation

Ginn BT, Steinbock B, Kahveci M, & Steinbock O. (2004). Microfluidic devices for the Belousov-Zhabotinsky reaction. *Journal of Physical Chemistry A, 108*, 1325-1332.

Measuring conceptual understanding on oxygen binding and delivery in a biochemistry course

Summary: Oxygen binding to hemoglobin in the blood and its delivery from the lung to the tissues are conceptually assessed by a new two-tier diagnostic test. This study presents the development stages and the validity evidence of the two-tier diagnostic test.

Kahveci M, Jin L. (2018). Biennial Conference on Chemical Education (BCCE).

The validity measure relies on seven expert opinions who are professors and actively teach- ing biochemistry courses across the United States. The remaining number of questions turns out to be 11. Besides, the analysis of the preliminary data, which is expected to be about 30 undergraduates, will provide the evidence on students' conceptual patterns about oxygen binding to hemoglobin and its delivery to tissues. In conclusion, this study contributes to the chemistry education research by a new instrument on a difficult-to-learn biochemistry topic and its preliminary results.

Citation

Kahveci M, & Jin L. (2018). *Measuring conceptual understanding on oxygen binding and delivery in a biochemistry course*. Paper presented at Biennial Conference on Chemical Education (BCCE). Notre Dame, IN, USA. July 29 – August 2, 2018.

Alternative assessment method in biochemistry education: Graphical representation of oxygen binding and delivery

Summary: Conceptual understanding is one of the essential levels of understanding in biochemistry. Some topics in biochemistry also require students to use complex graphical representations and mathematical knowledge to understand concepts and explain physiological phenomena.

Kahveci M, Jin L. (2017). DePaul University Teaching and Learning Conference.

This workshop focuses on how to measure students' conceptual understanding in the context of undergraduate biochemistry course at DePaul University.

The topic of oxygen binding to hemoglobin in the blood and its delivery from the lung to tissues will be assessed not only by asking direct information, which may eventually be answered by recalling and recognizing (i.e. rote learning), but also by asking students' reasoning behind their answers. This topic is difficult for students to learn. Students are expected to interpret how oxygen pressure determines the oxygen saturation level in hemoglobin; how to map out the saturation level at a given pressure thus the amount of oxygen delivered; how tissue acidity correlates with the level of CO2 carbon dioxide, and how changes in both as well as another modulator molecule affect the release of oxygen from hemoglobin to tissue thus its delivery from the lung to tissues and the adaptation of a person to high altitude.

Development stages of two-tier diagnostic instrument will be introduced in the context of oxygen binding and delivery in body.

Outline:

- Conceptual presentation about assessing student understanding (~10 mins)
- Conceptual presentation about oxygen binding and delivery (~7 mins)
- Presenting developmental stages of exemplary two-tier diagnostic instrument –sample questions (~8 mins)
- Group activity –designing a two-tier diagnostic test (~30 mins)
- Conclusion / question (~5 mins)

Citation

Kahveci M, & Jin L. (2017). *Alternative assessment method in biochemistry education: Graphical representation of oxygen binding and delivery*. Paper presented at DePaul University Teaching and Learning Conference. Workshop. Chicago, IL, USA. May 5, 2017.

Integrating learning objects into D2L to promote student learning of difficult scientific concepts

Summary: Advancements in computers, educational technologies, and broadband Internet bring new opportunities for chemistry educators and learners. This study introduces a valid and reliable method to effectively develop and easily deploy learning objects (i.e. Sharable Content Object Reference Model (SCORM)) in context of physical chemistry (PChem) course at DePaul University.

Kahveci M, French T. (2017). DePaul University Teaching and Learning Conference.

The pedagogical method for developing the learning objects relies on Inquiry-Based Science Education (IBSE) principles (AAAS, 1993; NRC, 2000). The deployment platform for the learning objects is D2L , in the context of an upper-level chemistry course (CHE302, Quantum Chemistry) at DePaul University.

This interactive session will focus on the development of a learning object dealing with the “particle in a box” (PIAB) model of quantum mechanics. This model, which is used to describe a quantum mechanical particle confined to a region in space, is often the first model students are introduced to in CHE302. In the co-requisite laboratory course (CHE303, Experimental Physical Chemistry I), the students perform a complementary experiment on a set of dye molecules, which can be modeled using the PIAB. Students collect and analyze an ultraviolet-visible light (UV-Vis) spectrum for each dye molecule in order to determine the wavelength of maximum absorbance. This wavelength, which depends on the length of the dye molecule, can be predicted using the PIAB model. As with any model, the PIAB is an idealized situation compared to those seen in real-life applications. This adds a further complication for students when trying to not only better understand the PIAB model, but also make sense of their experimental data.

We discuss the development of a learning object that focuses on the critical steps and conceptual underpinning of this experiment. Students would complete this “virtual experiment” before entering the laboratory. Students will be guided by the system as they walk through some predictive questions and simulations that will better prepare them to successfully perform this experiment. While learning objects are well-positioned to foster the strengthening of connections between the classroom and the laboratory, they are not limited to experimental applications. Their versatility in terms of context, structure, and design is a major advantage for students and instructors alike. The system not only walks the students through the activity but also grades their responses with feedback as they progress, which provides an out-of-classroom opportunity for student self-learning. By the end of this interactive session, attendees will better understand both the underlying educational framework and the design process of these learn- ing objects. Attendees will also work through the PIAB learning object, gaining first-hand knowledge of the student experience regarding learning objects.

Outline:

- Conceptual presentation about designing learning objects (~5 mins)
- Conceptual presentation about Inquiry-Based Science Education (~5 mins)
- Conceptual presentation about BIAB (~5 mins)
- Experiencing the learning objects (~10 mins)

- Conclusion (~5 mins)

References

AAAS. (1993). *Benchmarks for science literacy*. Washington, DC: American Association for the Advancement of Science. Retrieved from http://www.project2061.org/tools/benchol/bolintro.htm

NRC. (2000). *Inquiry and the national science education standards*. Washington, DC: National Academy Press.

Citation

Kahveci M, & French T. (2017). *Integrating learning objects into D2L to promote student learning of difficult scientific concepts*. Paper presented at DePaul University Teaching and Learning Conference. Chicago, IL, USA. May 5, 2017.

Advancing chemistry education research: Dual-Process Theories, Learning Objects and Student Response Systems (Keynote Lecture)

Summary: In response to the need for innovative methods in chemistry education research, I propose two directions in this study: (1) affective domain, and (2) fostering rich interactivity by the implementation of education technology.

Kahveci M. (2016). European Conference on Research in Chemical Education (ECRICE).

1 Introduction

Chemistry education research as a field is gradually advancing at university level. When speaking of chemistry educators and researchers, two distinctive groups of expertise emerge. One group, Group I, is made of chemists in pure science. This group of experts conduct their research in chemistry and take teaching role for chemistry courses close to their expertise. Another group, Group II, is composed of chemistry educators, who teach introductory level chemistry courses and all levels of pedagogical courses. Research-wise, chemistry educators conduct social and behavioral research on teaching and learning of chemistry. While informing policy makers and practice of teaching, chemistry education research needs to embrace both the depth and breadth of issues in chemistry and pedagogy. Thus, to advance chemistry education research, it is imperative that both group of experts need to cooperate mutually.

One of the key obstacles today is falling interest of youngster's towards science, as recently reported by European Union. Huge efforts have been made towards better science teacher training across Europe. To support this action, the direction of chemistry education research should align the focus towards alternative and innovative methods for teacher training and practice of chemistry teaching.

In response to the need for innovative methods in chemistry education research, I propose two directions as outlined below.

2 Affective Domain

New theoretical perspectives on how affective factors are the determinants of decision-making process and their implications to chemistry learning and teacher training are of interest. My suggestion is to adapt Dual-Process Theories into chemistry education research context. Dual-Process Theories attempt to ex- plain how behavior is generated through impulsive and reflective systems. The adaptation simply leads one to consider more affective aspects than usual and less cognitive aspects than usual. Therefore, practice of chemistry education from both teaching and research perspectives will likely to be more human-friendly.

3 Educational Technology for Rich Interactivity

Advancements in computing power and reduction of their cost to individuals make educational technology more available to the public at large. This fact brings new opportunities for chemistry educators. The foci here are rich interactivity and self-study environments provided by the media through adaptive systems. Two emerging possibilities have been the topic of my recent projects at undergraduate level chemistry classrooms:

1. Easy deployment and use of Learning Objects(LO),and
2. Integration of Student Response Systems (SRS).

Both of these projects required me to closely work with chemistry professors (Group I) and so the projects provided enough room to merge our expertise for innovative chemistry education projects. LOs support high student interaction with chemistry content through adaptive feedback loops and sustain student engagement through self-study. On the other hand, SRSs support in-class interaction which is ideal for face-to-face instruction and developing two-tier instruments in the context of chemistry education research to discover student conceptions.

4 Video of the Talk

Acknowledgements

The Organizing Committee of ECRICE 2016 kindly sponsored this Keynote Lecture. Canakkale Onsekiz Mart University Scientific Research Programs (BAP) funded the following projects:

- Physical chemistry education and learning objects: An implementation and development of the materials on inquiry-based approaches at higher education (Grant No. 2011/132 (page 0))
- Impact of instructional interactivity in chemistry education (Grant No. SBA-2015-569 (page 0))

Citation

Kahveci M. (2016). *Advancing chemistry education research: Dual-Process Theories, Learning Objects and Student Response Systems* (**Keynote Lecture**). Paper presented at the European Conference on Research in Chemical Education (ECRICE), Barcelona. September 7 – 10, 2016.

An account for Inquiry-Based Science Education through Dual-Process Theories

Kahveci M. (2015). European Science Education Research Association.

Citation

Kahveci M. (2015). *An account for Inquiry-Based Science Education through Dual-Process Theories*. Paper presented at European Science Education Research Association (ESERA). Helsinki, Finland. August 31 - September 4, 2015.

A project idea on working definition of IBSE in Europe through artificial intelligence

Kahveci M. (2015). European Commission and SiS.net. (Brokerage Event).

Citation

Kahveci M. (2015). *A project idea on working definition of IBSE in Europe through artificial intelligence*. Paper presented at the European Commission and SiS.net. (Brokerage Event). Brussels, Belgium. May 22, 2015.

A project idea on working definition of IBSE in Europe through artificial intelligence

Kahveci M. (2015). IOSTE Eurasian Regional Symposium and Brokerage Event Horizon 2020.

Citation

Kahveci M. (2015). *A project idea on working definition of IBSE in Europe through artificial intelligence*. Paper presented at the IOSTE Eurasian Regional Symposium and Brokerage Event Horizon 2020, Istanbul, Turkey. April 24 – 26, 2015.

Construct validity and reliability measures of scores from the Science Teachers' Pedagogical Discontentment (STPD) Scale

Summary: The Science Teachers' Pedagogical Discontentment scale has formerly been developed in the United States and used since 2006. This study utilizes this instrument in an international perspective.

Kahveci M, Kahveci A, Mansour N, Alarfaj MM. (2015). National Association for Research in Science Teaching International Conference (NARST).

Based on the perceptions of selected teachers, the scale is deeply rooted in the cultural and national standards. Given these limitations, the measurement integrity of its scores has not yet been conclusively established internationally, such as in the Saudi Arabia context. The items of the scale are slightly tailored to make the instrument suitable in the specific context, such as with respect to country-based regulations, reforms, and everyday practices of science teachers and their professional development initiatives. Item-based descriptive statistics, the measure's factor structure as opposed to its former validity studies, and factor-based reliability scores are investigated in the present report. Thus, this study extends the validity and reliability measures of the instrument to the international scale and further confirms its appropriateness to measure teacher attitudes towards inquiry-based science education initiatives.

Citation

Kahveci M, Kahveci A, Mansour N, & Alarfaj MM. (2015). *Construct validity and reliability measures of scores from the Science Teachers' Pedagogical Discontentment (STPD) Scale*. Paper presented at the National Association for Research in Science Teaching International Conference (NARST). Chicago, IL, USA. April 11 - 14, 2015.

Affective factors and instructional interactivity in education

Kahveci M. (2015). Association of Private Schools Society in Turkey.

Citation

Kahveci M. (2015). *Affective factors and instructional interactivity in education*. Paper presented at the Association of Private Schools Society in Turkey. Kaya Plazzo Hotel, Antalya, Turkey. January 28 - 31, 2015.

Introduction to Moodle Learning Management System and use of learning objects

Kahveci M. (2015). Association of Private Schools Society in Turkey.

Citation

Kahveci M. (2015). *Introduction to Moodle Learning Management System and use of learning objects*. Paper presented at the Association of Private Schools Society in Turkey. [Workshop]. Kaya Plazzo Hotel, Antalya, Turkey. January 28 - 31, 2015.

Affective dimensions in chemistry education: Focus on educational technology and learning objects

Kahveci M. (2014). Biennial Conference on Chemical Education (BCCE).

Citation

Kahveci M. (2014). *Affective dimensions in chemistry education: Focus on educational technology and learning objects*. Paper presented at the Biennial Conference on Chemical Education (BCCE). [Symposium]. Grand Valley State University, Allendale, MI, U.S.A. Au- gust 3 - 7, 2014.

Adaptation of learning objects to inquiry-based chemical education: Phase diagrams

Kahveci M. (2013). National Chemistry Education Conference (UKEK).

Citation

Kahveci M. (2013). *Adaptation of learning objects to inquiry-based chemical education: Phase diagrams*. Paper presented at the National Chemistry Education Conference (UKEK). Karadeniz Technical University, Trabzon, Turkey. September 5 - 7, 2013.

Experiences in reviewing proposals under FP7 Program and some tips for improving proposals

Kahveci M. (2013). CARPE Conference.

Citation

Kahveci M. (2013). *Experiences in reviewing proposals under FP7 Program and some tips for improving proposals*. Paper presented at the CARPE Conference. Manchester Metropolitan University, Manchester, UK. November 4 - 6, 2013.

Phase diagrams and conceptual learning

🐾 Kahveci M. (2013). National Chemistry Education Conference (UKEK).

Citation

Kahveci M. (2013). *Phase diagrams and conceptual learning*. Paper presented at the National Chemistry Education Conference (UKEK). Karadeniz Technical University, Trabzon, Turkey. September 5 - 7, 2013.

Preparing a grant proposal for funding by the European Commission and presenting a grant proposal in chemistry education

Kahveci M. (2013). National Chemistry Education Conference (UKEK).

Citation

Kahveci M. (2013). *Preparing a grant proposal for funding by the European Commission and presenting a grant proposal in chemistry education*. Paper presented at the National Chemistry Education Conference (UKEK). [Workshop]. Karadeniz Technical University, Trabzon, Turkey. September 5 - 7, 2013.

Physical chemistry education and learning objects (PChemLO): A technological implementation to foster inquiry-based learning and diminish gender differences at higher education

Summary: The main objectives of the PChemLO project are to develop learning objects that are based on inquiry-based teaching principles and investigate student attitudes and motivation to utilize these learning objects.

Kahveci M. (2012). 21st Symposium on Chemical and Science Education.

PChemLO (page 0) project is a collaborative project between the Divisions of Chemistry Education and Physical Chemistry at Canakkale Onsekiz Mart University in Turkey. The main objectives of the project are to develop learning objects that are based on inquiry-based teaching principles and investigate student attitudes and motivation to utilize these learning objects. The project investigates male and female students' affective dimensions in using the online materials (i.e. learning objects) to learn advanced chemistry topics such as physical chemistry. By the implementation of technology into the inquiry-based science education as the teaching strategy may diminish the gender differences on learning science contents and using technology for learning. In this poster, the method to develop and implement learning objects in a physical chemistry course will be presented. In addition, benefits and disadvantages of using such systems with the gender differences perspective will be presented from relevant literature.

Citation

Kahveci M. (2012). *Physical chemistry education and learning objects (PChemLO): A technological implementation to foster inquiry-based learning and diminish gender differences at higher education*. Paper presented at the 21st Symposium on Chemical and Science Education. [Poster]. TU Dortmund University, Dortmund, Germany. May 17-19, 2012.

Einstellungen zur Chemie und zum Chemielernen bei türkischen und deutschen Jugendlichen

Kegler A, Kahveci M, Kremer K. (2012). Jahrestagung der Gesellschaft für Didaktik der Chemie und Physik (GDCP).

Citation

Kegler A, Kahveci M, & Kremer K. (2012). *Einstellungen zur Chemie und zum Chemielernen bei türkischen und deutschen Jugendlichen*. Paper presented at the Jahrestagung der Gesellschaft für Didaktik der Chemie und Physik (GDCP). [Poster]. Leibniz- Universität, Hannover, Germany. September 17 - 20, 2012.

Affective dimensions in chemistry education: Much left for future research

Kahveci M. (2012). Biennial Conference on Chemical Education (BCCE).

Citation

Kahveci M. (2012). *Affective dimensions in chemistry education: Much left for future research*. Paper presented at the Biennial Conference on Chemical Education (BCCE). Pennsylvania State University, University Park, PA, USA. July 29 - August 2, 2012.

Physical chemistry education and learning objects (PChemLO): Affective aspects of implementation

Kahveci M. (2012). Biennial Conference on Chemical Education (BCCE).

Citation

Kahveci M. (2012). *Physical chemistry education and learning objects (PChemLO): Affective aspects of implementation*. Paper presented at the Biennial Conference on Chemical Education (BCCE). Pennsylvania State University, University Park, PA, USA. July 29 - August 2, 2012.

Affective dimensions in chemistry education

Kahveci M. (2012). Biennial Conference on Chemical Education (BCCE).

Citation

Kahveci M. (2012). *Affective dimensions in chemistry education*. Paper presented at the Biennial Conference on Chemical Education (BCCE). [Symposium]. Pennsylvania State University, University Park, PA, USA. July 29 - August 2, 2012.

Depicting chemistry majors' self-perceptions in learning chemistry

Kahveci M. (2011). National Association for Research in Science Teaching (NARST).

Citation

Kahveci M. (2011). *Depicting chemistry majors' self-perceptions in learning chemistry*. Paper presented at the National Association for Research in Science Teaching (NARST). Orlando, FL, USA. April 3 - 6, 2011.

Analysis of Turkish high-school chemistry examination questions according to Bloom's Taxonomy

Kahveci M. (2009). International Conference of Educational Research Association Turkey (EAB).

Citation

Kahveci M. (2009). *Analysis of Turkish high-school chemistry examination questions according to Bloom's Taxonomy*. Paper presented at the International Conference of Educational Research Association Turkey (EAB). Canakkale, Turkey. May 1 - 3, 2009.

FP7 Science in Society Program: The evaluation process of large scale proposals for coordination and support actions

Kahveci M. (2009). International Conference of Educational Research Association Turkey (EAB).

Citation

Kahveci M. 2009. *FP7 Science in Society Program: The evaluation process of large scale proposals for coordination and support actions*. Paper presented at the International Conference of Educational Research Association Turkey (EAB). Canakkale, Turkey. May 1 - 3, 2009.

Quantifying high school students’ self-perceptions in learning chemistry

Kahveci M. (2009). National Association for Research in Science Teaching (NARST).

Citation

Kahveci M. 2009. *Quantifying high school students’ self- perceptions in learning chemistry*. Paper presented at the National Association for Research in Science Teaching (NARST). Garden Grove, CA, USA. April 17 - 21, 2009.

A conceptual framework for fidelity of implementation of instructional materials

Summary: This paper describes the outcomes of the first strand of the "Applied Research on Science Materials Implementation: Bringing Measurement of Fidelity of Implementation (FOI) to Scale" project.

Century J, Rudnick M, Freeman C, Isaacas A, Leslie D, Kahveci M. (2008). American Educational Research Association (AERA).

This three-year, National Science Foundation-funded project has two main goals. First, is the measurement of fidelity of implementation of K-8 science and mathematics instructional materials in the Chicago Public Schools (CPS). Second, is the development of a suite of instruments to measure the fidelity of implementation of standards-based science and mathematics instructional materials at the K-8 level. In order to achieve these goals, our first step was the development of a conceptual framework for describing fidelity of implementation. This paper describes the development and components of the FOI Conceptual Framework.

Citation

Century J, Rudnick M, Freeman C, Isaacas A, Leslie D, & Kahveci M. (2008). *A conceptual framework for fidelity of implementation of instructional materials*. Paper presented at the American Educational Research Association (AERA). New York, USA. March 24 - 28, 2008.

Students' motivation to use technology for learning

Kahveci M, Coskun S, Taylan RD. (2008). World Conference on Educational Multimedia, Hypermedia and Telecommunications (ED-MEDIA).

Citation

Kahveci M, Coskun S, & Taylan RD. (2008). *Students' motivation to use technology for learning*. Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications (ED-MEDIA). Vienna, Austria. June 30 - July 4, 2008.

A framework for measuring fidelity of implementation of science instructional materials

Summary: This paper describes outcomes of the first strand of the "Applied Research on Science Materials Implementation: Bringing Measurement of Fidelity of Implementation (FOI) to Scale" project.

Century J, Rudnick M, Freeman C, Leslie D, Kahveci M, Isaacs A. (2008). National Association for Research in Science Teaching (NARST).

This three-year, National Science Foundation-funded project is working measure the fidelity of implementation of standards-based science and mathematics instructional materials at the K-8 level in a large urban school district through the development and application of a suite of FOI instruments. This first strand focused on the development of a conceptual framework for describing FOI. We began with a thorough review of previous work on FOI, then engaged in an iterative process of theoretical review and framework development. We determined that the framework needed to comprise categories of critical components (the essential elements of the intended program model) and engaged in a process of science instructional materials review that focused on identifying of these critical components and placing them into framework categories. This paper will describe the application of the framework to the development of instruments, and the ways this framework will help to accurately describe teacher use of science instructional materials and support our ability to provide useful, meaningful information about FOI to the school district being served.

Citation

Century J, Rudnick M, Freeman C, Leslie D, Kahveci M, & Isaacs A. (2008). *A framework for measuring fidelity of implementation of science instructional materials*. Paper presented at the National Association for Research in Science Teaching (NARST). Baltimore, USA. March 30 - April 2, 2008.

Investigating the existence of interactivity in various instructional settings

Kahveci M. (2007). National Association for Research in Science Teaching (NARST).

Citation

Kahveci M. (2007). *Investigating the existence of interactivity in various instructional settings*. Paper presented at the National Association for Research in Science Teaching (NARST). New Orleans, USA. April 15 - 18, 2007.

A finer grain understanding of teachers' adoption of reforms?: Development of an instrument to assess science teachers' pedagogical discontentment (STPD)

Southerland SA, Sowell S, Kahveci M, Granger EM, Saka, Y. (2007). National Association for Research in Science Teaching (NARST).

Citation

Southerland SA, Sowell S, Kahveci M, Granger EM, & Saka, Y. (2007). *A finer grain understanding of teachers' adoption of reforms?: Development of an instrument to assess science teachers' pedagogical discontentment (STPD)*. Paper presented at the National Association for Research in Science Teaching (NARST). New Orleans, USA. April 15 - 18, 2007.

Interactive learning in mathematics education: Review of recent literature

Summary: This review investigates the use of certain types of interaction in mathematics education.

Kahveci M, Imamoglu Y. (2007). Society for Information Technology and Teacher Education (SITE).

These types include interaction between students, interaction between teacher and students, and interaction between students and leaning technology. In small cooperative groups, factors that affect interaction are as follows: group composition, type of interaction, effect of teacher, interdependence of students and nature of the task. Some teaching implications of the findings were discussed as follows: students should be encouraged to use multiple representations to develop problem solving strategies; students' motivation to learn should be mastery goal oriented, teachers should encourage student participation in classroom discussions; students should be expected to provide mathematical reasoning rather than producing the right answer; and design of tasks should be suitable to promote skills such as mathematical reasoning and metacognition.

Citation

Kahveci, M. & Imamoglu, Y. (2007). Interactive Learning in Mathematics Education: Review of Recent Literature. In R. Carlsen, K. McFerrin, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of SITE 2007–Society for Information Technology & Teacher Education International Conference* (pp. 3269-3276). San Antonio, Texas, USA: Association for the Advancement of Computing in Education (AACE). Retrieved August 30, 2020 from https://www.learntechlib.org/primary/p/25115/ .

An instrument development: Interactivity Survey (the IS)

Summary: Although there is no agreement as to what interactivity and interaction mean in educational literature, researchers are in agreement that both terms are vital for teaching and learning one way or another. This paper includes item development stages and validity and reliability analyses of the Interactivity Survey (the IS) that attempts to uncover the perceptions of professors working at colleges of education from universities around the world. The pilot study with a sample size of 262 faculty members provided the evidence of high internal consistency of the IS. All of the statistical test results and the final version of the instrument were provided.

Kahveci M. (2007). Society for Information Technology and Teacher Education (SITE).

1 Introduction

Interactivity and interaction are two terms that have been used very often in the literature of science, science education, computer science, educational technology, distance education, curriculum and instruction, and psychology (Chim et al., 2003; Fahy, 2003; Juwah, 2003; Kirsh, 1997; Tobin, 1993; Wagner, 1994). While reporting a recent review of the literature about interactivity in computer-mediated college and university education, Muirhead and Juwah (2004) emphasize that interactivity and interaction are critical in underpinning the learning process in face-to-face, campus based, and distance education.

Empirical and conceptual studies about interactivity and interaction are usually associated with operational definitions specific to the educational contexts investigated. Thus, while the importance of interactivity was emphasized in considerable studies in education (Anderson, 2002; Bork, 1982; Fahy, 2003; Fulford & Zhang, 1993; Hirumi, 2002; D. Jonassen, 1988; D. H. Jonassen, 1985; Juwah, 2003; Kahveci, in press; Kirsh, 1997; Muirhead & Juwah, 2004; Rose, 1999; Simpson & Galbo, 1986; Sims, 1997, 2000; Wagner, 1989, 1990, 1994, 1997), there is no settled view of what it means for instruction (Kirsh, 1997). In fact, interactivity is essentially medium-specific (e.g. videodisks, distance education, educational software, etc.), somewhat arbitrary, and not very descriptive (Schwier & Misanchuk, 1993) and so, there remain many unresolved questions about the nature of interactivity (Kirsh, 1997). The operational definitions and given meanings are generally context-dependent, and fluctuate from one meaning to another as the context in education changes. For example, Kirsh (1997) builds his argument on the concept of interactivity mostly as it applies to the design of multimedia learning environments along the lines of cognitive approach.

Also, due to the lack of theory to guide research, information available in the literature about the complex phenomenon of interactivity and interaction is rather limited (Anglin & Morrison, 2003). In support of this issue, Sims (1997) states that “interactivity is important but there appears to be no consensus of what interactivity actually represents or involves.” Sims (2000) also claims that it is important to reassess not only the notion of interactivity but its role in enhancing the learning process in its various forms. Moreover, Fulford and Zhang (1993) suggest that the model of motivational categories can provide a framework to research interactivity in education.

Too, Wagner (1990) recommends that future considerations of interaction and interactivity should draw upon the results of research from the following domains; learning and learning theory, instructional theory, instructional design, and instructional delivery.

In the following, as being the main instrument of an extensive research, the development of Interactivity Survey (the IS) is presented. With the IS, the research, whose findings will be reported by subsequent manuscripts somewhere else, investigates the perceptions of faculty members at colleges of education around the world about instructional interactivity by specifically undertaking a comparative analysis of the key aspects surrounding the functional definitions of interactivity, the existence of interactivity in various instructional settings, the attributes of interactivity as a function of motivation and learning theories, and the events of interactivity to discern any relationships that might exist with respect to the eight predictors; gender, age, present status, highest degree obtained, geographic region, research interest in interactivity, personal learning preferences, and department.

2 Developing the Interactivity Survey Items

Interactivity Survey is composed of six subsections: (1) functional definitions of interactivity, (2) existence of interactivity in various instructional settings, the attributes of interactivity as a function of (3) motivation and (4) learning theory, (5) the events of interactivity, and (6) learning styles.

In the last section of the questionnaire, thirteen items measure learning styles (VARK Questionnaire), which were developed by Neil Fleming (2001) and were added to the IS with Fleming's permission. Thus, the first five subsections were developed for this study while, due to the space requirements for the conference proceedings, the full resources for item development process were omitted (please contact with the author if you are interested). After developing the initial set of questions from the related literature, the content validity and its pilot study over a sub-sample were carried out.

3 The Content Validity of the Interactivity Survey

Eight professors, who were the experts in the filed, assisted with the content validity of the interactivity survey. Validity has been defined as referring to the appropriateness, correctness, meaningfulness, and usefulness of the specific conclusions that researches derive from their data (Fraenkel & Wallen, 2003, p.150). Of the eight professors, one professor was in the Department of Educational Leadership, and had experience of teaching courses via the Internet, one professor was working in a private company for a while and was very well known in the literature with her interactivity research focusing on conceptualization, and six professors were at the Department of Educational Leadership and Learning Systems. Of the six professors, one was an expert in learning and instructional theories, one was proficient in assessment and distance education, one was a survey researcher and statistics lecturer, and three were experts in instructional systems design.

For the purpose of this review process, a specific program was written in PHP and MySQL and an additional functionality was given to the online survey so that a reviewer was able to read each question and, while taking the survey, to evaluate its clarity by the following scale:

1. The item is clear.
2. The item is somewhat clear.
3. The item is not clear.

Furthermore, a text area was provided for the reviewers to give their comments or suggestions to improve the clarity of an unclear item. The analysis of the reviewer evaluation provided the content-related evidence of validity, which assured that the content and format of the instrument were appropriate and comprehensive. The review process was completed in two phases:

1. *The First Phase Review*. Four professors participated in the first phase of content validation. I met with each of the reviewers while taking the survey. With the permission of the reviewers, I also recorded their verbal comments with a digital voice recorder. After making modifications on the ambiguous survey items, I sent the URL of the online survey for the second phase review.
2. *The Second Phase Review*. One professor who participated in the first phase review agreed to review again for the second phase. The second phase review was completely performed online (i.e. no face-to-face interaction with the reviewers). In this process, the reviewers were able to rate the clarity of the items and type their comments on each item. The ratings for the first and second phase reviews were given below, in Figure 1. After making the second revisions on the survey items based on the comments of reviewers and observing the remarkable increase of ratings in the second phase review, I proceeded to conduct the pilot study with the final version of the survey instrument (as seen in Table 15).

3.1 Pilot Study

After developing the IS and making it fully functional online, the pilot study allowed the reliability analysis of the IS. The sample of the pilot procedure consisted of one professor from each university in the database, resulting in 314 faculty members. Of 314 invitation emails, 52 warning messages, indicating that the email could not be delivered, returned. Getting these kinds of messages was expected because I started to collect email addresses about two years ago. Thus, some email addresses may have been out-of-date. Secondly, server side delays or errors in delivering email messages or even SPAM filters whose rules are very strictly set (e.g. accepting emails only from certain domains and rejecting others) may have resulted in undeliverable messages, as well. As a result, the sample size for the pilot study turned out to be 262. The pilot study was completed in one week with two reminder emails. Of the 262 invitations, 59 faculty members participated in the study.

Using online surveys in research is getting more popular due to their high response rate. In a comparative study of response rate for mail, fax, and online survey in a university setting, Cobanoglu, Warde, and Moreo (2000) reported 42% response from online survey, 26% for mail survey, and (3) 17% for fax survey.

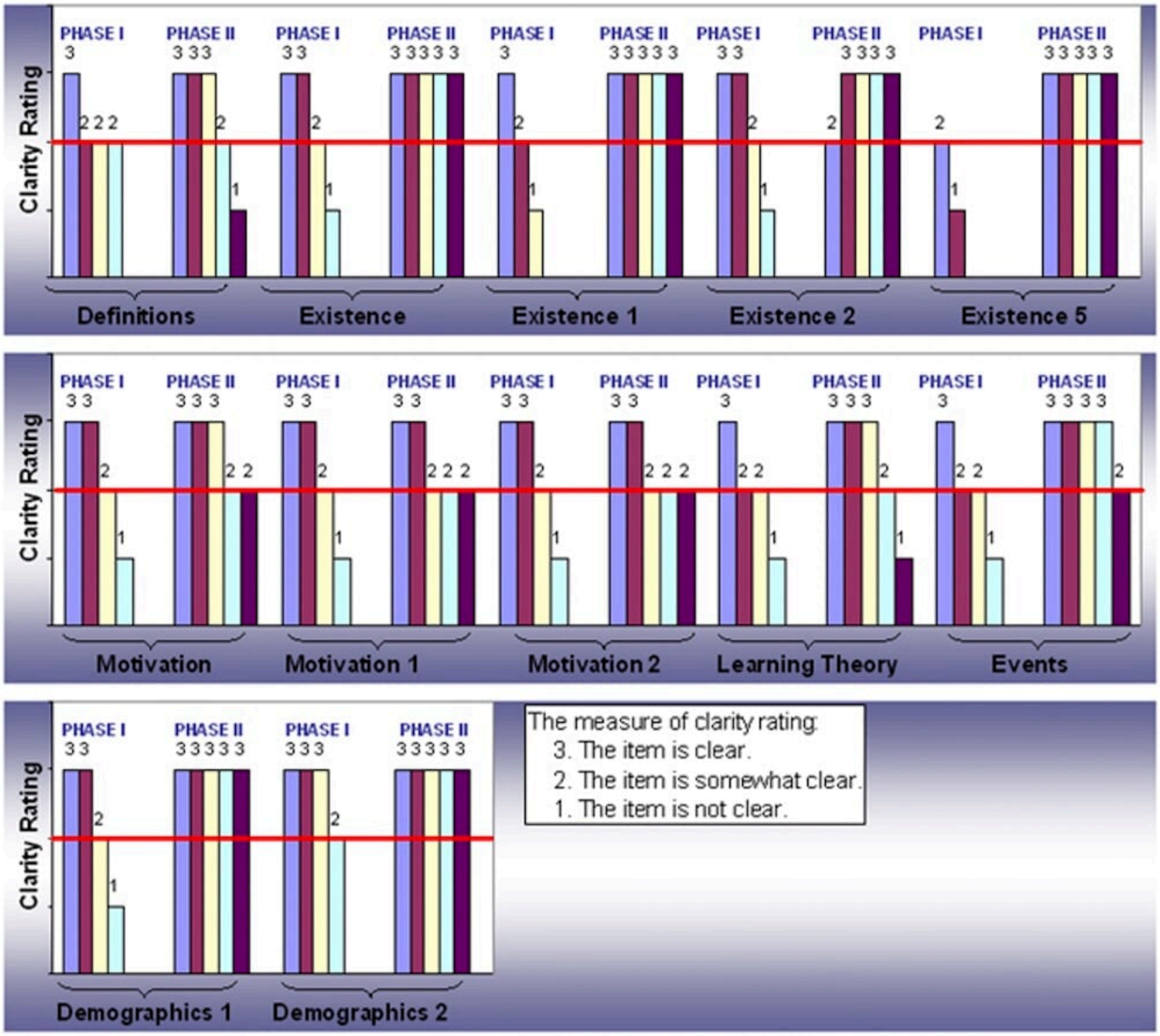


Figure 1. Item clarity ratings of the experts participated in the content validity process.

Reliability refers to the consistency of the scores obtained (Fraenkel & Wallen, 2003). I calculated the consistencies of the items within the instrument, which is called equivalent-forms method. This calculation required factor analyses to see the emerging categories among the items.

Initially there were 66 items, as presented in the earlier sections of this paper, developed to measure the following dimensions: (1) functional definitions of interactivity, (2) existence of interactivity in various instructional settings, the attributes of interactivity as a function of (3) motivation and of (4) learning theories, and (5) the events of interactivity. After the content validity process and the reliability analyses (of the pilot study), of the 66 items, 17 items causing internal inconsistency were removed from the survey. Thus, 49 items representing to and measuring the dependent variables left. Predictors or independent variables such as gender, age, present status, highest degree obtained, research interest in interactivity, department, and personal learning styles (VARK survey) remained with no changes.

4 Factor Loadings and the Internal Consistency Analyses

In this section, I apply two main statistical procedures to calculate the reliability of the instrument: (1) factor analysis and (2) Cronbach alpha internal consistency test. Factor loadings are the indicators of the commonalities that a group of variables measure. The components extracted are indicated as only numerical values rather than under a title because the purpose of this analysis is to calculate internal consistency. Deeper discussions on each component were given in the Chapter IV on the final survey data.

Table 1. Factor loading for the functional definitions of interactivity.

Items	Components	
	1	2
1-1. Interaction is all manner of behavior, in which individuals and groups act upon each other.		.813
1-2. Interactions are reciprocal events that require at least two objects and two actions. Interactions occur when these objects and events mutually influence one another.		.717
1-3. Interactivity is a complex, dynamic coupling between two or more intelligent parties. The nature of interaction requires cooperation, coordination of activities, power exertions over each other, and a degree of negotiation.	.713	
1-4. Interactivity describes a learning process in which the student and the system (i.e. computer) alternate in addressing each other. Typically, each is capable of selecting alternative actions based on the actions of the other.	.685	
1-6. Interaction is typically thought of as sustained two-way communication among two or more persons for purposes of explaining and challenging perspectives.	.676	
1-9. Interactivity is the extent to which the communicator and the audience respond to, or are willing to facilitate, each other's communication needs.	.578	
Note. Extraction method: Principal component analysis. Number of valid cases: 59.		

Table 2. Reliability of the functional definitions of interactivity.

Components	Cronbach Alpha
Component 1	.52
Component 2	.58

Although the reliability is moderately high on these items, they remained in the survey. The main reason was that the definitions of interactivity may be differently perceived by professors who were in different fields of education. That's why; I decided that I should include these items in the final version of the survey. Besides, these operational definitions of interactivity are known in education literature and used in many researches. The items 1-5, 1-7, and 1-8 were removed because I thought their meanings were distributed among other given definitions.

Table 3. Factor loading for the existence of interactivity in various instructional settings.

Items	Components		
	1	2	3
2-1-2. Professor lecturing and encouraging students to ask content related questions: Students are able to state their opinions about the content.			.910[a]
2-1-3. Professor lecturing and giving some pauses for small group discussions: Students in small groups have discussions about the content being lectured and share their conclusions with others in class.			.927[a]
2-2-1. Use of computer programs (i.e. educational software) for teaching/learning.		.915[b]	
2-2-2. Use of the Internet for teaching/learning.		.912[b]	
2-5-1. By reading textbook.	.853[c]		
2-5-2. By studying visual representations in the textbook such as charts, diagrams, and photographs.	.936[c]		
2-5-3. By solving problems or doing concept maps while reading.	.884[c]		
Note. Extraction method: Principal component analysis. Rotation method: Varimax with Kaiser Normalization. Number of valid cases: a (N=58), b (N=54), and c (N=49).			

Table 4. Reliability of the existence of interactivity in various instructional settings.

Components	Cronbach Alpha
Component 1	.87
Component 2	.82
Component 3	.79

For the items measuring the existence of interactivity in various instructional settings, the factor loadings turned out to be very high and internally highly consistent. The items numbered 2-1-1, 2- 1-4, 2-1-5, and 2-1-6 were removed from the survey.

Table 5. Factor loading for the function of interactivity.

Items	Component
	1
3-1. Interactivity is a strategy to increase learner's motivation.	.827
3-2. Interactivity is a strategy to increase learner's participation.	.868

Note. Extraction method: Principal component analysis. Number of valid cases: 57.

Table 6. Reliability of the function of interactivity.

Components	Cronbach Alpha
Component 1	.71

For the items measuring the function of interactivity, the factor loadings turned out to be very high and internally highly consistent. The item numbered 3-3 was removed from the survey.

Table 7. Factor loading for the attribute of interactivity as a function of motivation (The ARCS Theory).

Items	Components		
	1	2	3
3-4-1. Captures students' attention by using unexpected approaches to teaching such as personal experiences.		.679	
3-4-3. Maintains students' attention by varying the instructional presentation.		.731	
3-4-4. Emphasizes the utility of instruction by stating how instruction relates to personal goals.		.551	.549
3-4-5. Emphasizes the utility of instruction by having the learners determine how instruction relates to personal goals.			.595
3-4-6. Motivates students by providing opportunities for personal achievement.	.582		
3-4-7. Makes instruction relevant by building on learners' previous experiences.	.729		

Note. Extraction method: Principal component analysis. Rotation method: Varimax with Kaiser Normalization. Number of valid cases: 56.

Items	Components		
	1	2	3
3-4-8. Creates a positive expectation for success by making clear the instructional objectives.		.599	
3-4-10. Provides opportunities for students to successfully attain challenging goals.	.701		
3-4-11. Provides learners with a reasonable degree of control over their own learning.	.811		
3-4-12. Allows learners to use newly acquired skills by providing opportunities to solve “real-world” problems.			.465
3-4-13. Uses positive consequences such as verbal praise, real or symbolic rewards.			.753
3-4-14. Ensures equity by providing consistent standards for all learners’ tasks and accomplishments.			.731
Note. Extraction method: Principal component analysis. Rotation method: Varimax with Kaiser Normalization. Number of valid cases: 56.			

Table 8. Reliability of the attribute of interactivity as a function of motivation (The ARCS Theory)

Components	Cronbach Alpha
Component 1	.82
Component 2	.81
Component 3	.72

For the items measuring the attribute of interactivity as a function of motivation (The ARCS Theory), the factor loadings turned out to be very high and internally highly consistent. The items numbered 3-4-2 and 3-4-9 were removed from the survey.

Table 9. Factor loading for the attributes increasing interactivity.

Items	Component
	1
3-5-1. Between teachers and students.	.938
Note. Extraction method: Principal component analysis. Rotation method: Varimax with Kaiser Normalization. Number of valid cases: 56.	

Items	Component
	1
3-5-2. Among students.	.915
3-5-3. Between students and content.	.680
Note. Extraction method: Principal component analysis. Rotation method: Varimax with Kaiser Normalization. Number of valid cases: 56.	

Table 10. Reliability of the attributes increasing interactivity.

Components	Cronbach Alpha
Component 1	.81

For the items measuring the attributes increasing interactivity, the factor loadings turned out to be very high and internally highly consistent. No items in this section were removed from the survey.

Table 11. Factor loading for the attribute of interactivity as a function of Conditions of Learning.

Items	Components	
	1	2
4-1-1. Gaining attention.		.592
4-1-2. Informing learners of the objective.	.583	.574
4-1-3. Stimulating recall of prior learning.	.900	
4-1-4. Presenting the stimulus.	.760	
4-1-5. Providing learning guidance.	.634	
4-1-6. Eliciting performance.	.717	
4-1-7. Providing feedback.		.789
4-1-8. Assessing performance.		.847
4-1-9. Enhancing retention and transfer.	.595	
Note. Extraction method: Principal component analysis. Rotation method: Varimax with Kaiser Normalization. Number of valid cases: 55.		

Table 12. Reliability of the attribute of interactivity as a function of Conditions of Learning.

Components	Cronbach Alpha
Component 1	.85
Component 2	.79

For the items measuring the attribute of interactivity as a function of Conditions of Learning (Gagné), the factor loadings turned out to be very high and internally highly consistent. No items in this section were removed from the survey.

Table 13. Factor loading for the events of interactivity.

Items	Component
	1
5-3. A lecture, in which the learner is a passive recipient of information.	.838
5-5. A lecture in which the student is spectator.	.922
5-6. A lecture in which the student is participant.	.602
5-9. A lecture in which student absorbs material.	.821
Note. Extraction method: Principal component analysis. Rotation method: Varimax with Kaiser Normalization. Number of valid cases: 55.	

Table 14. Reliability of the events of interactivity.

Components	Cronbach Alpha
Component 1	.80

For the items measuring the events of interactivity, the factor loadings turned out to be very high and internally highly consistent. The items 5-1, 5-2, 5-4, 5-7, 5-8, and 5-10 were removed from the final version of the survey.

Thus, the complete list of revised items was given in Table 15. As given in Table 1 through Table 6, the narratives associated with each set of items and their Likert scale did not change.

Table 15. The list of the interactivity survey items. As a result of the content validity and the pilot study, some items have been removed partially or totally from the survey totally while some were modified only.

	Item Number	Items
1	1-1.	Interaction is all manner of behaviour, in which individuals and groups act upon each other. Interaction is characterized as reciprocity in actions and responses in an infinite variety of relationships: verbal or non-verbal, conscious or non-conscious, enduring or causal.
2	1-2.	Interactions are reciprocal events that require at least two objects and two actions. Interactions occur when these objects and events mutually influence one another.
3	1-3.	Interactivity is a complex, dynamic coupling between two or more intelligent parties. The nature of interaction requires cooperation, coordination of activities, power exertions over each other, and a degree of negotiation.
4	1-4.	Interactivity describes a learning process in which the student and the system (i.e. computer) alternate in addressing each other. Typically, each is capable of selecting alternative actions based on the actions of the other.
5	1-5.	Interactivity is what the computer permits that no other instructional approach can approximate except for one-on-one Socratic dialogue between an expert and a learner.
6	1-6.	Interaction is typically thought of as sustained two-way communication among two or more persons for purposes of explaining and challenging perspectives.
7	1-7.	Interactivity means giving the learner some control over the pace and the sequence of the instruction.
8	1-8.	Interactivity is a continuous construct capturing the quality of two-way communication between two parties.
9	1-9.	Interactivity is the extent to which the communicator and the audience respond to, or are willing to facilitate, each other's communication needs.
10	2-1.	Classroom.
11	2-2.	Computer aided teaching/learning.
12	2-3.	Use of Multimedia for teaching/learning.
13	2-4.	Use of videodiscs for teaching/learning.
14	2-5.	Text book.
15	2-6.	Laboratory (i.e. hands-on inquiries).
16	2-1-1.	Professor lecturing only.

	Item Number	Items
17	2-1-2.	Professor lecturing and encouraging students to ask content related questions: Students are able to state their opinions about the content.
18	2-1-3.	Professor lecturing and giving some pauses for small group discussions: Students in small groups have discussions about the content being lectured and share their conclusions with others in class.
19	2-1-4.	Professor lecturing and promoting discussion groups to share their conclusions.
20	2-1-5.	Professor lecturing and organizing individuals to make presentations.
21	2-1-6.	Professor organizing and encouraging individuals to make presentations but not lecturing at all.
22	2-2-1.	Use of computer programs (i.e. educational software) for teaching/learning.
23	2-2-2.	Use of the Internet for teaching/learning.
24	2-2-3.	Use of presentation software (e.g. PowerPoint) and simulation programs (e.g. Java).
25	2-5-1.	By reading textbook.
26	2-5-2.	By studying visual representations in the textbook such as charts, diagrams, and photographs.
27	2-5-3.	By solving problems or doing concept maps while reading.
28	3-1.	Interactivity is a strategy to increase learner's motivation.
29	3-2.	Interactivity is a strategy to increase learner's participation.
30	3-3.	Interactivity should be perceived as a learning outcome rather than a generic teaching technique.
31	3-4-1.	Captures students' attention by using unexpected approaches to teaching such as personal experiences.
32	3-4-2.	Stimulates lasting curiosity with problems that invoke mystery.
33	3-4-3.	Maintains students' attention by varying the instructional presentation.
34	3-4-4.	Emphasizes the utility of instruction by stating how instruction relates to personal goals.
35	3-4-5.	Emphasizes the utility of instruction by having the learners determine how instruction relates to personal goals.
36	3-4-6.	Motivates students by providing opportunities for personal achievement.

	Item Number	Items
37	3-4-7.	Makes instruction relevant by building on learners' previous experiences.
38	3-4-8.	Creates a positive expectation for success by making clear the instructional objectives.
39	3-4-9.	Allows learners to set their own goals.
40	3-4-10.	Provides opportunities for students to successfully attain challenging goals.
41	3-4-11.	Provides learners with a reasonable degree of control over their own learning.
42	3-4-12.	Allows learners to use newly acquired skills by providing opportunities to solve "real-world" problems.
43	3-4-13.	Uses positive consequences such as verbal praise, real or symbolic rewards.
44	3-4-14.	Ensures equity by providing consistent standards for all learners' tasks and accomplishments.
45	3-5-1.	Between teachers and students.
46	3-5-2.	Among students.
47	3-5-3.	Between students and content.
48	4-1-1.	Gaining attention.
49	4-1-2.	Informing learners of the objective.
50	4-1-3.	Stimulating recall of prior learning.
51	4-1-4.	Presenting the stimulus.
52	4-1-5.	Providing learning guidance.
53	4-1-6.	Eliciting performance.
54	4-1-7.	Providing feedback.
55	4-1-8.	Assessing performance.
56	4-1-9.	Enhancing retention and transfer.
57	5-1.	Teacher-centred instruction.
58	5-2.	Learner-centred instruction.
59	5-3.	A lecture, in which the learner is a passive recipient of information.

	Item Number	Items
60	5-4.	Active learning through hands-on exploration, often via laboratory or computer program.
61	5-5.	A lecture in which the student is spectator.
62	5-6.	A lecture in which the student is participant.
63	5-7.	A lecture based on instructionist principles (i.e. feeding students information).
64	5-8.	A lecture based on constructionist principles (i.e. letting students find information for themselves).
65	5-9.	A lecture in which student absorbs material.
66	5-10.	A lecture in which student learns how-to-learn.

5 Conclusion

This study developed, 49-item instrument, the IS, to evaluate the perceptions of faculty members at colleges of education at universities around world. The instrument was originally designed for online data collection with an adaptive feature. Evidence for the instrument's content validity and its reliability is based on the pilot study. Principle component analysis with Varimax rotation was applied to extract major components of the items.

Further research by the utilization of the IS also confirmed its reliability in a large scale (i.e. 2752 participants). Related manuscripts about the findings of that specific research are forthcoming and are planned to be submitted to this journal and elsewhere as well.

It seemed this instrument and its findings provided better understandings about the conundrum, Instructional Interactivity, by specifically undertaking and comparing the common perceptions of faculty members in the field of education. The participants of this study were experienced instructors, known researchers in various fields of education, and theory developers about instruction, instructional delivery, motivation, and learning.

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Citation

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Working to measure the impact of professional development activities: Developing an instrument to quantify pedagogical discontentment

Summary: The aim of this research is to empirically define the construct of science teachers' pedagogical discontentment, a construct that describes teachers' lack of satisfaction or contentment that occurs when they recognize a mismatch between their own pedagogical beliefs and goals and their actual classroom practices.

Southerland SA, Sowell S, Kahveci M, Granger EM, Owen OF. (2006). National Association for Research in Science Teaching (NARST).

From a conceptual change perspective, we explore the meaning of pedagogical discontentment, and discuss its role in shaping teachers' receptivity to messages of reform. In tandem with introducing this construct, we present an instrument to be used to measure teachers' pedagogical discontentment, an instrument that eventually will allow science educators to better describe the affective states of teachers entering professional development experiences. To inform this instrument, we conducted interviews with practicing elementary and secondary science teachers to provide us with first-hand accounts of how teachers discuss aspects of their current science teaching practices that they perceived as being less effective than desired. From these interviews a group of 41 items were designed around a group of 5 subscales. The psychometric evaluation of these items is offered, along with suggestions for the revision of this instrument.

Citation

Southerland SA, Sowell S, Kahveci M, Granger EM, & Owen OF. (2006). *Working to measure the impact of professional development activities: Developing an instrument to quantify pedagogical discontentment*. Paper presented at the National Association for Research in Science Teaching (NARST). San Francisco, USA. April 4 - 7, 2006.

Matematiği öğrenmede kendi-kendini kavrama

Summary: Bu çalışmada Türkiye'nin kuzeybatısındaki bazı liselerde, öğrencilerin matematiği öğrenmede kendini-kavrama (self-concept) özellikleri incelenmiştir.

Kahveci M, Oztekin B, Algedik E. (2006). 7. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi.

Özel ve devlet okulu gibi çeştli kurumların 9., 10., ve 11. sınıflarına kayıtlı 147 kız ve 89 erkek öğrenci olmak üzere, toplam 236 öğrenci veri toplama sürecine katılmıştır. Quantitatif nitelikli bu araştırmanın veri toplama süreci, Fennema-Sherman Özgüven Ölçeği (Fennema & Sherman, 1976) ile tamamlanmıştır. Bu ölçek, öğrencilerin matematiği öğrenme ile ilgili tutumlarını, kendilerine-güvenme (self-confidence), matematiğin bir insan hayatındaki pratik yerini, öğretmenlerin öğrencilere karşı tutumlarını, ve cinsiyetin matematik öğrenmedeki rolünü çeşitli yönlerden sorgulayarak, öğrencilerin bu etkenler üzerindeki algılarını ortaya çıkarmayı hedefler. Ölçek, güvenilir bir şekilde uygulanması ve anlamlı yorumlanabilmesi için, Türkçe'ye çevrilmiştir. Cronbach Alpha testi ölçeğin yüksek güvenirliliğini onaylamıştır (toplam $\alpha = .92$). 47 sorudan oluşan ölçeğin, sorular arasındaki ilişkilerin yüksek olması nedeni ile (Bartlett Test istatistiksel anlamlı farklı, $p=.000$) Faktör Analiz uygulanmıştır. Faktör Analiz sonucunda, yukarıda verilen tipik Fennema-Sherman Özgüven Ölçeği kategorileri elde edilmiştir. Fakat, faktör kategorilerine katkılarının yeterli düzeyde olmaması ve ölçeğin iç-güvenirliliğini olumsuz etkilemesi nedeni ile 10 soru ihmal edilerek analiz tamamlanmıştır. Sonuç olarak, toplam dört kategori üzerinde Genel Doğrusal Model (General Lineer Model) analizi ileri düzey Post-Hoc karşılaştırması ile gerçekleştirilmiştir. Bu analiz ile öğrencilerin yanıtları yaş, cinsiyet, sınıf, ve matematik notları açısından herbir dört kategori için detaylı karşılaştırılmıştır. Bu karşılaştırmalar ve sonuçları detaylı bir şekilde tartışılmıştır.

Liselerde matematik öğretiminin motivasyonla ilgisi ile alakalı önemli sonuçlar elde edilmiştir. Bu çalışmanın sonuçları ve bu sonuçları destekleyen literatür taramasından yola çıkılarak, öğrencilerin matematikle ilgili kendi düşünceleri ve onların motivasyon düzeylerinin yakından ilişkili oldukları bulunmuştur. Bu ilişki sadece bir açıdan değil, dört farklı açıdan olduğu yapılan Faktör Analiz ve Genel Doğrusal Model (General Lineer Model) analizlerin sonucunda bulunmuştur. Bu durum, ölçeği dört farklı kategoriye ayırmıştır. Bunlar, konu (matematik) hakkında öğrencinin kişisel güveni, öğretmen tutumunun öğrenci tarafından algılanışı, konunun (matematiğin) içeriğinin işe yararlığı ve konunun (matematiğin) erkek baskınlığında algılanması ile ilgili kategorilerdir. Her bir kategoride 12 soru bulunmaktadır, bu soruların yarısı öğrencilerin matematiğe karşı pozitif, yarısı negatif tutumlarını belirleyen sorulardır. Örnek olarak, "Matematiği öğrenebileceğime eminim." öğrencinin matematiğe karşı pozitif tutumunu belirleyecek bir soruyken, "Okul bitince çok fazla matematik kullanacağıma inanmıyorum." öğrencinin matematiğe karşı negatif tutumunu belirlemek amaçlı bir sorudur.

Bu çalışmada, öğrencilerin notları arttıkça, kendine güven seviyelerinde de güçlü bir artış olduğu görülmüştür. Ayrıca, kendine güven seviyeleri, yaş ve sınıfa göre değişiminde istatistiksel anlamlı farklılıklar gözlemlenmemiştir. Ancak, matematikte 9. sınıftaki bir öğrencinin kendine güveni, 11. sınıftaki bir öğrencinin kendine güveninden istatiksel anlamlı farklılık ile daha düşük olduğu görülmüştür ($p = .000$).

Matematiğin erkek baskınlığında olması ile ilgili yapılan araştırmalarda, öğrencilerin "Kadınlar da erkekler kadar matematik yapabilirler." fikirlerinin yaş, sınıf ve öğrencilerin matematik dersinde aldıkları notlardaki değişiklikle arasında anlamlı farklılıklar görülmemiştir. Ancak, öğrencinin cinsiyeti bu konudaki fikirlerinde farklılık göstermesine sebep olmuştur ($p=.001$).

Çalışmanın, öğretmen tutumunun öğrenci tarafından algılanışı ile ilgili olan kategorisinde yaş, cinsiyet, sınıf, öğrencilerin matematik dersinde aldıkları notlardaki farklılıklarla, öğretmen tutumunun öğrenci tarafından algılanışı arasındaki ilişkide istatistiksel anlamlı farklılıklar görülememiştir.

Son olarak, öğrencilerin matematikte aldıkları notlar yükseldikçe, matematiğin bir insan hayatındaki pratik yerini daha iyi kavradığı gözlemlenmiştir.

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Turkish high-school students' attitudes toward learning mathematics

Summary: Attitudes towards mathematics, mathematics self concept and motivation to learn mathematics of 79 students coming from two high schools in Istanbul were measured. Three surveys were administered to the students at their schools; Fennema-Sherman scale, Self Description Questionnaire (SDQ II) and Students' Motivation to Learn Mathematics (SMOT); having Cronbach alpha reliabilities of .92, .92 and .93 respectively. Factorial analyses were conducted for the three scales. As a result, attitudes towards mathematics was decomposed into eight factors, labeled usefulness of mathematics content, mathematics perceived as male domain, perceived mathematics success, teacher support, perceived mathematics ability and teacher's belief about mathematics competency.

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Keywords. Mathematics self-concept, motivation, attitude, factor analysis, Fennema-Sherman scale, Self Description Questionnaire, SMOT

1 Introduction

As mathematics is one of the components of basic education, every student has to develop mathematics skills to some extent. At the same time, it is generally accepted as a difficult subject because of its abstract nature and many students struggle to relate the mathematics they learn at school to real life situations. The necessities of current educational system in Turkey, national tests such as OKS and OSS (administered to enter high schools and universities, respectively) add the pressure on the students to be successful at mathematics. Still, students cannot perform well in both national and international tests. 2005 OSS results show that mathematics average was only 7.5 out of 25 questions, with standard deviation on 11.5 (OSYM, 2005). The results of international studies TIMSS 1999 (Mullis et al., 2000) and PISA 2003 (OECD, 2004) indicate that Turkish students' mathematics average is significantly below than international average in all content areas (Turkey M=423, SD=105; international M=500, SD=100 in PISA 2003). Looking at the means according to school type show that private schools have higher mean (M=557, SE= 6.47) than public schools (M=418, SE= 53.68), even higher international average for private schools (M=526, SE= 1.49).

In PISA 2003, apart from the achievement test, students were asked about the following aspects of their approaches to learning mathematics: motivation, self related beliefs (self-concept and self- efficacy), mathematics anxiety and learning strategies. Results show that Turkish students coming from private and public schools (where students selected by national tests) have motivation, self-concept and self-efficacy in learning mathematics higher than international average (OECD, 2004). In addition, Turkish students exhibited lower mathematics anxiety compared to other nations in Europe (OECD, 2004). However, in state schools, self-concept and self-efficacy are lower than international average, with higher mathematics anxiety. Feeling of belonging to the school is lower than international average in both types of schools (Berberoglu, 2004).

This study aims at looking more closely to students' motivational attitudes towards mathematics at two Turkish private schools. Another aim is to investigate whether these attitudes are affected by gender, age, and mathematics grade.

1.1 Motivation

Motivation can be defined as "an internal state that arouses, directs and maintains behavior"(Woolfolk, 2004). Causes of motivation can be internal, such as personal values or interests (intrinsic motivation) or they can be external, like rewards or punishments (extrinsic motivation). Attribution theory of motivation suggests that, students' explanations for causes of academic success or failure can be categorized by the following dimensions: locus, referring to whether the causes come from the individual or from other people; stability, referring to whether the causes change over time; and controllability, whether the individual is able to control the cause (Weiner, as cited in Kloosterman, 1988). Students' reasons for the cause of success or failure effects their motivation to attempt academic tasks. Students' goal orientations also effect their motivation. Students having task-focused (learning) goals show personal interest in the task and believe that the task itself is rewarding, whereas students with performance goals either try to be best performer or be more successful than others (performance approach), or try not to be the least competent or be the poorest performer (performance avoidance)(Skaalvik & Skaalvik, 2004).

1.2 Self-Concept, Self-Efficacy, and Self-Esteem

Self-concept is "the composite of ideas, feelings and attitudes people have about themselves" (Woolfolk, 2004). Self-concept is divided into sub-categories of general, academic, social, emotional and physical self-concepts (Shavelson et al., 1976). Academic self- concept can be subject or course specific, but they are not item or task specific. Mathematics self- concept can be defined as "positive or negative orientation toward one's ability, performance, and success in the learning of mathematics" (Ma & Kishor, 1997b). Self-efficacy, on the other hand, is a judgment of one's ability to perform a specific task (Pajares & Miller, 1994). Self-esteem refers to the one's judgments of self-worth (Woolfolk, 2004).

1.3 Attitude toward Mathematics

In their meta-analysis, Ma and Kishor (1997b) state that attitude toward mathematics refers to students' affective responses to whether they find mathematics easy/difficult or important/unimportant. They also quote the following definition by (Neale, 1969):

> Attitude toward mathematics refers to students' affective responses to "a liking or disliking of mathematics, a tendency to engage in or avoid mathematical activities, a belief that one is good or bad at mathematics and a belief that mathematics is useful or useless."

2 Related Literature

Studies investigating motivation, self-concept, self-efficacy, mathematics attitude and mathematics achievement concentrates on the following topics: relationship between motivation and achievement (Greene et al., 1999), relationship between self-concept, self-efficacy, and mathematics achievement (Ma & Kishor, 1997b; Norwich, 1987; Pajares & Miller, 1994; Pietsch et al., 2003), relationship between mathematics attitude and achievement (Ma & Kishor, 1997a), and gender differences in these constructs (Githua & Mwangi, 2003; Skaalvik & Skaalvik, 2004; Stipek & Gralinski, 1991).

Greene et al. (1999) used a modified version of expectancy –value model (Ecless et al., as cited in Greene et al., 1999) which shows the relationships of values, beliefs and goals with effort and achievement, with respect to gender. Results show that task achievement goals predicted effort stronger than the other constructs. Prediction of achievement and effort differed according to gender and mathematics class type.

Kloosterman (1988) measured attribution style, effort as a mediator of mathematical ability, and failure as an acceptable phase in learning mathematics in order to explain self-confidence of 7th grade students. He concluded that attribution style was the strongest predictor of confidence, followed by effort as a mediator of mathematical ability. The results also showed that students were making attributions for failure more often than success. As an attempt to investigate predictive relations between self-efficacy and subsequent attainment in a mathematics task, Norwich (1987) assessed self-efficacy of primary school students (9-10 year-olds) over four trials. Between trials, students attempted mathematics tasks. Self-efficacy made no independent contribution to predicting task performance. However, prior self-efficacy and mathematics performance, independently predicted relations with self-efficacy when students were not familiar with the task but self-concept did not. When the students were familiar with the task, only prior self-efficacy had predictive relation with subsequent self-efficacy. In addition, mathematics self-concept and prior mathematics performance made significant contributions to predicting subsequent task performance. Another study about the effects of self-efficacy and self- concept on mathematics success was conducted by Pajares and Miller (1994) on undergraduate students. They concluded that, self-efficacy has stronger direct effects on performance than mathematics self- concept, perceived usefulness of mathematics, prior experience with mathematics or gender. Mathematics self-concept and high school level had modest direct effects. Self-efficacy was also reported to mediate the effect of gender and prior experience on mathematics self-concept, perceived usefulness of mathematics and mathematics performance. A more recent study on high school students (Pietsch et al., 2003) showed that competency component of self-concept was differentiated with affective component but overlapped with self-efficacy when they were measured at the same level of generality. Social comparison (students comparing themselves with other students) had equal effect on both self-concept and self-efficacy. Self-efficacy beliefs were more strongly related with mathematics performance.

In their meta analysis of the relationship of attitudes towards self and achievement in mathematics, Ma and Kishor (1997b) considered self-concept, gender role and family support to be the main indicators of attitude. They reached the following conclusions:

- The self-concept-achievement, the family support-achievement, and the male domain-achievement relationships were all statistically reliable;
- The three relationships did not show evident gender differences;
- The three relationships consistently decreased from the junior high grades to the senior high grades;
- The self-concept-achievement relationship varied as a function of ethnicity, whereas the family support achievement relationship was consistent across ethnic backgrounds;
- The three relationships were not consistent across sample selection;
- The self-concept-achievement relationship varied with sample size, whereas the family support-achievement and the male domain-achievement relationships were sample-size invariant;
- The self-concept-achievement relationship varied over time, whereas the family support-achievement and the male domain-achievement relationships remained almost unchanged over time; and
- There were no statistically significant interaction effects on any of the three relationships.

Gender differences were the basic concern in Stipek and Gralinski's study (1991). They measured achievement related beliefs of 3rd grade (8-9 year-olds) and high school (13-14 year-olds) students before and after a regular mathematics exam. Girls reported lower ability and expectation of success. They were less likely to attribute success to high ability and failure to luck; instead, they were more likely to attribute failure to low-ability than boys. Gender differences were also found in the study of Githua & Mwangi (2003), in favor of boys, in students' perception of likelihood of success and satisfaction in learning mathematics. They also concluded that girls in co-educational secondary schools in Kenya have the least self-concept and motivation to learn mathematics. Comparing mathematics and verbal self-concept of boys and girls in Norwegian high schools, Skaalvik & Skaalvik (2004) also encountered gender differences: Boys had higher self-concept, performance expectations, intrinsic motivation and self-enhancing ego orientation than girls in mathematics; while girls had higher intrinsic motivation to learn language than boys. Verbal self-concept of older students was higher than their mathematical self-concept, regardless of gender.

As can be understood from the above literature, relationships between motivational aspects, self- concept, self-efficacy and mathematics performance are complex in nature. In order to explain these relationships, Barker et al. (2004) proposed a model that relates achievement motivation (mastery, performance and social purposes) and academic self-concept (English and mathematics). The model fitted their data, however, not equally well across both sex groups.

3 Method

3.1 Participants and Procedures

Participants for this study were selected from two high schools, A and B, in Istanbul, Turkey. Both schools are private schools, students of which come from upper-class families. 40 students were chosen from school A and 39 students were chosen from school B using proportional stratified sampling with levels of grade and gender. Data were collected by administrating a paper-based survey to the students at their schools. Surveys asked for demographic information about gender, age, class and mathematics grade. Confidentiality of the students was protected and mathematics teachers in the schools helped to administer the instruments. Table 1 shows the distributions of participants with respect to their gender and grade level.

Grade	Male	Female	Total
9th	10	11	**21**
10th	9	17	**26**
11th	15	17	**32**
Total	**34**	**45**	**79**

Table 1. Distribution of the participants. Please note that there are no parametric comparisons done between male and female students with respect to their grade level. i.e. Mean comparisons are carried out among the total values showed in bold.

3.2 Instruments

A modified version of Fennema-Sherman Scale (Doepken et al., 1993) was administered to the students. This scale measures participants' attitudes towards mathematics. The test consists of 47 items, divided into the following categories: personal confidence about subject matter, usefulness of subject's content, subject perceived as male domain, and perception of teacher attitudes. Items were translated into Turkish for this study and its overall reliability including all items turned out to be very high internal consistency (Cronbach alpha; α = .92).

Secondly, mathematics self-concept of participants was measured using the related self-concept items in SDQ II: Academic Self Description Survey II, which was originally developed by Marsh (1990) and then adapted by Githua and Mwangi (2003). These items were combined with items taken from ASDQ II, as adopted by Barker et al. (2004). All items in the adapted form were translated into Turkish language. Overall Cronbach alpha of the scale was found to be highly reliable (α = .92).

Furthermore, another survey measuring students' motivation to learn mathematics (SMOT) by a 28- item scale (Githua & Mwangi, 2003) was applied. The instrument originally measured the following categories: interest in learning mathematics, satisfaction, relevance, and perceived probability of success. 28 items were transcribed into Turkish language. The data collected showed strong internal consistency, having α = .93.

Response categories for all scales were from strongly agree to strongly disagree as follows:

- Strongly Disagree (1)
- Disagree (2)
- Neutral (3)
- Agree (4)
- Strongly Agree (5)
- Items reflecting negative attitude were scored in reverse order.

3.3 Data Analysis

Principal component factor analyses with varimax rotation were conducted for the three scales. Rotation method was done with Kaiser Normalization. To construct factor categories, factor loadings equal to or higher than .40 were accounted for a factor component. Categories containing less than three items were removed from the analyses. A further mean comparison analysis, GLM, will be carried out although their results will not be presented in this paper.

4 Results

4.1 Attitudes toward Mathematics

Bartlett's test of sphericity ($p=.000 < .05$) indicated high correlation among items in the Fennema- Sherman scale. Thus, factor analysis over 47 items were performed. As a result, twelve factors were extracted, seven of which were interpretable due to the internal consistency condition (see Table 3). Categories corresponding to these factors are labeled as follows: Usefulness of mathematics content (U), mathematics perceived as a male domain (M), perceived mathematics success (PS), teacher support (TS), perceived mathematics ability (PA), perceived mathematics performance (PP), teachers' belief of competency in mathematics (TB). The first two categories coincide with the original categories as of Doepken et al.(1993)'s study, while the items in the category of personal confidence in subject matter (as used by Doepken et al.) was further divided into three categories, namely, PA, PP, and PS. Perception of teacher attitude was also divided into two categories: TS and TB. Means, standard deviations and reliability coefficients of the categories, as well as the corresponding item numbers are given in Table 2.

Factor Category	Mean	Standard Deviation	Cronbach Alpha	Contributing Items
U	3.04	1.26	.91	3, 5, 10, 13, 14, 21, 27, 29, 34, 39, 42, 44
M	4.29	1.04	.90	9, 11, 15, 18, 24, 28, 31, 38, 46
PS	3.47	1.16	.84	7, 19, 23, 32, 43
TS	3.76	.99	.80	2, 20, 45
PA	4.03	.91	.76	1, 7, 16, 33, 37,40
PP	3.05	.97	.80	12, 25, 41
TB	3.66	1.01	.64	16, 21, 22, 26

Table 2. Mean, standard deviation and reliability coefficients of the extracted factors from Fennema-Sherman survey.

Item	U	M	PS	TS	PA	PP	TB
I1	.185	-.104	.229	-.136	**.548**	.329	.183
I2	-.013	.056	.041	**.863**	.128	.153	.147
I3	**.776**	.171	.035	.114	-.111	.292	.021
I5	**.822**	.193	.038	.056	-.072	.363	.091
I7	-.004	.016	.451	.140	**.581**	-.094	-.073
I9	.151	**.689**	.257	.133	-.132	-.109	-.182
I10	**.759**	-.031	.124	.086	.101	.261	-.012
I11	.016	**.742**	.121	-.109	-.026	-.092	.396
I12	.234	-.108	.314	.189	.257	**.636**	.141

Item	U	M	PS	TS	PA	PP	TB
I13	**.839**	.091	.035	-.112	-.033	-.161	.040
I14	**.420**	.039	-.086	.377	-.093	.182	.216
I15	-.035	**.885**	-.077	.069	.065	.042	.050
I16	.100	.001	.253	.348	**.426**	-.152	**.432**
I18	.141	**.754**	-.069	.268	-.084	-.013	-.047
I19	.227	.091	**.724**	.222	.053	.065	.349
I20	.122	.074	.134	**.810**	-.004	.008	-.004
I21	**.573**	.206	.167	.012	.240	.076	**.480**
I22	.181	.134	.239	.192	-.065	.129	**.566**
I23	.290	.194	**.714**	.073	.067	.108	.177
I24	.040	**.621**	.062	-.137	-.018	.078	**.517**
I25	.335	.086	.379	-.035	.152	**.593**	-.114
I26	.162	.237	.067	.309	.224	.131	**.516**
I27	**.805**	.180	.171	-.027	.069	.269	-.119
I28	-.058	**.793**	.273	-.025	.018	-.012	.026
I29	**.652**	-.060	.034	.215	.217	-.076	-.262
I31	.141	**.785**	.014	-.129	-.023	.047	.012
I32	.266	.121	**.685**	.180	.194	.358	.155
I33	.026	-.088	.132	.082	**.781**	.271	-.012
I34	**.816**	-.121	.054	-.060	.213	.045	.125
I37	.246	.037	.077	.070	**.851**	.179	.007
I38	.158	**.675**	.159	.224	.026	.191	.027
I39	**.765**	.076	.151	.162	.081	.003	.110
I40	-.051	.063	.019	.332	**.515**	-.143	.128

Item	U	M	PS	TS	PA	PP	TB
I41	.379	.114	.150	.085	.257	**.733**	.147
I42	**.689**	.075	.327	.039	.256	.160	.241
I43	.089	.114	**.806**	.101	.228	.170	-.126
I44	**.640**	.132	.308	.353	.057	-.231	.114
I45	.081	.238	.286	**.674**	.179	.006	-.035
I46	.108	**.860**	-.006	.118	.092	.032	.051

Table 3. Factor loadings of Fennema-Sherman survey.

4.2 Mathematics Self-Concept

Bartlett's test of sphericity (p=.000 < .05) indicated high correlation among items in the combined ASDQ II and SDQ II scale. Thus, factor analysis over 17 items were performed. As a result, three factors were extracted and all of them were interpretable (see Table 4). Categories corresponding to these factors are: perceived performance and success (PS); feelings towards mathematics (F); perceived mathematics ability (PA). There two items appeared in more than one category. Means, standard deviations and reliability coefficients of the categories, as well as the corresponding item numbers are given in Table 5.

Item	PS	F	PA
A1	**.785**	.345	.278
A2	**.844**	.097	.095
A3	**.561**	**.511**	.243
A4	**.784**	.288	.308
A5	**.676**	.338	.217
S1	**.751**	.157	.269
S2	**.679**	.378	.431
S3	**.460**	.146	**.475**
S4	.025	.001	**.756**
S5	.233	**.796**	.015
S6	.180	.380	**.647**

Item	PS	F	PA
S7	**.652**	.396	-.121
S8	.373	**.706**	.068
S9	**.628**	.111	.093
S10	.330	.067	**.676**
S11	**.725**	.317	.257
S12	.147	**.746**	.395

Table 4. Factor loadings of ASDQ II & SDQ II.

Factor Category	Mean	Standard Deviation	Cronbach Alpha	Contributing Items
PS	2.77	.98	.98	A1, A2, A3, A4, A5, S1, S2, S3, S7, S9, S11
F	2.53	1.02	.80	A3, S5, S8, S12
PA	3.00	1.09	.65	S3, S4, S6, S10

Table 5. Mean, standard deviation and reliability coefficients of extracted factors from ASDQ II & SDQ II.

4.3 Students' Motivation to Learn Mathematics

Bartlett's test of sphericity ($p=.000 < .05$) indicated high correlation among items in the SMOT scale. Thus, factor analysis over 28 items were performed (see Table 6).

Item	U	IM	PS	S
1	.420	**.692**	.082	.117
2	.117	**.736**	.156	-.022
3	.301	**.656**	.020	-.062
4	.178	**.694**	.192	.252
6	-.061	.336	**.484**	-.197

Item	U	IM	PS	S
7	.108	.415	**.733**	.080
8	**.621**	.284	.150	-.043
9	.019	.228	.007	.121
10	-.051	.092	**.759**	.065
12	.159	**.676**	.176	.058
13	.168	**.525**	-.163	.288
14	**.823**	.142	-.001	.076
15	.322	.346	.064	-.005
16	.320	.075	-.101	**.783**
17	**.568**	.204	.188	.230
18	.068	**.614**	.228	.329
19	.190	.188	.139	**.780**
20	-.206	.093	**.493**	**.557**
21	.131	.090	**.714**	.055
23	.294	.166	-.009	.408
24	**.825**	.000	-.062	.233
25	**.863**	.197	-.080	.122
26	**.708**	.351	.091	.118
27	**.493**	**.511**	.231	-.003
28	.385	.077	.324	-.035

Table 6. Factor loadings for SMOT survey.

Eight factors were extracted from the factor analysis. Due to the internal consistency condition, four of these factors were interpreted. Categories corresponding to these four factors are: usefulness of mathematics (Utility value) (U), intrinsic motivation (IM), perceived probability of success (PS), and satisfaction (S). Means, standard deviations and reliability coefficients of the categories, as well as the corresponding item numbers are given in Table 7.

Factor Category	Mean	Standard Deviation	Cronbach Alpha	Contributing Items
U	3.09	1.07	.83	8, 14, 17, 24, 25, 26, 27
IM	3.57	1.02	.85	1,2,3,4,12,13,18,27
PS	2.51	1.05	.72	6,7,10,20,21.S:16,19,20,23
S	3.09	.88	.70	16, 19, 20

Table 7. Mean, standard deviation and reliability coefficients of the extracted factors from SMOT.

5 Conclusion

Three different scales were administered to students of two high schools in Turkey, in order to examine their attitudes towards mathematics, mathematics self-concept and motivation to learn mathematics. A series of factor analyses were conducted to the obtained data.

Attitudes towards mathematics was decomposed into eight factors, labeled usefulness of mathematics content, mathematics perceived as male domain, perceived mathematics success, teacher support, perceived mathematics ability and teacher's belief about mathematics competency. Mathematics self-concept was decomposed into three factors: Perceived performance and success, feelings towards mathematics and perceived mathematics ability. Among these factors, mean differences with respect to mathematics grade occurred in perceived performance and success, and feelings towards mathematics.

Motivation to learn mathematics items were decomposed into four factors labeled usefulness of mathematics, intrinsic motivation, perceived probability of success and satisfaction. Significant mean differences were found in scores of intrinsic motivation with respect to class and mathematics grade, while perceived probability of success scores had significant differences with respect to age.

Overall, the categories have means higher than 3.00; with the exception of perceived performance and success in SDQII (PS) (M= 2.77, SD= .98), feelings toward mathematics (F) (M= 2.53, SD=1.02) and perceived probability of success in SMOT (PS) (M= 2.2.51, SD=1.05). It can be concluded that, in general, these students have a positive attitude towards mathematics, and they are highly motivated. This coincides with the findings of PISA 2003; Turkish students coming from private schools have higher motivation and mathematics self-concept than the international average (Berbero"lu, 2004). The reason for this difference could be due to the better educational opportunities offered by private schools.

Looking at the means of the extracted factors across the three surveys, the category mathematics perceived as male domain (M) has the highest mean (M= 4.29, SD= 1.04). Keeping in mind that items reflecting negative attitude were scored in reverse order, this means students do not see mathematics as a male domain.

This study investigated the motivational attitudes toward mathematics of students in two private schools. Similar studies should be conducted public schools in order to compare and contrast the situation, because there seems to be a big gap between different types of schools in Turkey, especially in mathematics education, as suggested by PISA 2003 results.

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interpretations. Review of Educational Research, 46(3), 407-441.

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Citation

Kahveci M, & Imamoglu Y. (2006). *Turkish high-school students' attitudes toward learning mathematics*. Paper presented at the International Conference on the Teaching of Mathematics (ICTM). Istanbul, Turkey. June 30 - July 5, 2006.

The use of interactivity in a graduate class: A case study

Summary: This research examines a series of presentations, given by graduate students, in partial fulfillment of the requirements for a core class in a doctorate program of science education in a Southeastern university in the U.S.

Kahveci M. (2004). Society for Information Technology and Teacher Education (SITE).

The interactivity component of the course was mostly provided by the integration of WWW and computer software along with the student presentations. The interviews with four students and with the professor were digitally stored and transcribed for the data analyses. The advantages and disadvantages of the use of high level of interactivity were discussed.

Citation

Kahveci, M. (2004). The use of interactivity in a graduate class: A case study. In R. Ferdig, C. Crawford, R. Carlsen, N. Davis, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of SITE 2004–Society for Information Technology & Teacher Education International Conference* (pp. 1221-1223). Atlanta, GA, USA: Association for the Advancement of Computing in Education (AACE). Retrieved August 28, 2020 from https://www.learntechlib.org/primary/p/13638/ .

Instructional interactivity endeavor and the Spiral's Value MEMEs

Summary: A frequent argument in education literature is that delivery of instruction accompanied by real-time interactivity will increase learning and improve instruction in practice.

Kahveci M. (2004). World Conference on Educational Multimedia, Hypermedia and Telecommunications (ED-MEDIA).

The trend of the use of interactivity intensifies when content gets more abstract and instruction is delivered at a distance. Especially, teaching complex and abstract science concepts by the use of telecommunications technology signifies the meaning and appropriate levels of interactivity for instruction. However, definition and forms of interactivity are often confined by instructional mediums such as computer programs and telecommunications technologies. This article discusses the meaning of interactivity and levels of interactivity constructed in the education literature (in the field of computer-based instruction (CBI), cognitive science, and social science). It is concluded that the Spiral Dynamics (Beck & Cowan, 1996) can be considered as a comprehensive framework to base conceptual parameters for the operation of interactivity in terms of human psychology and ability of learning.

Citation

Kahveci M (2004). Instructional interactivity endeavor and the Spiral's Value MEMEs. In L. Cantoni & C. McLoughlin (Eds.), *Proceedings of ED-MEDIA 2004–World Conference on Educational Multimedia, Hypermedia & Telecommunications* (pp. 1387-1391). Lugano, Switzerland: Association for the Advancement of Computing in Education (AACE). Retrieved August 28, 2020 from https://www.learntechlib.org/primary/p/12656/ .

The significance of interactivity in gender equitable education

Summary: Interactivity is perceived as a vital component of education to increase the quality of individuals' learning in the fields of science, mathematics, and engineering.

Kahveci M, Kahveci A. (2004). Society for Information Technology and Teacher Education (SITE).

An increasing body of research indicates that female students are especially underrepresented in those fields. In this paper, we investigate the interactivity of female students with their instructors in the courses of science, mathematics, and engineering. Surveying high level of interactivity with the help of computer integration to the present curricula would indicate the female students' sustained interest and success in favor of those underrepresented fields.

Citation

Kahveci M & Kahveci A (2004). The significance of interactivity in gender equitable education. In R. Ferdig, C. Crawford, R. Carlsen, N. Davis, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of SITE 2004–Society for Information Technology & Teacher Education International Conference* (pp. 1218-1220). Atlanta, GA, USA: Association for the Advancement of Computing in Education (AACE). Retrieved August 28, 2020 from https://www.learntechlib.org/primary/p/13637/ .

Instructional interactivity and technology components of a freshman chemistry course

Summary: Educational technologies have provided opportunities for better teaching and learning environments in chemistry.

Kahveci A, Kahveci M. (2004). Society for Information Technology and Teacher Education (SITE).

The difficulties of teaching large classes with the resulting limitations of face-to-face interaction between instructor and students have been long-term problems for chemistry teaching in college freshman chemistry classes. However, with the enhancement of technologies (e.g. World Wide Web (WWW), interactive compact disk technology, e-mail communications, etc.) at lower and lower costs, and by the use of these instructional technologies especially in high populated (over 150 students) freshman chemistry classes, overall interactivity necessary for viable knowledge construction increases. In this article, the theoretical significance of a technology enhanced General Chemistry course at a Southeastern University in the U.S. is discussed in terms of its various curricular elements in the frame of instructional interactivity.

Citation

Kahveci A & Kahveci M (2004). Instructional interactivity and technology components of a freshman chemistry course. In R. Ferdig, C. Crawford, R. Carlsen, N. Davis, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of SITE 2004–Society for Information Technology & Teacher Education International Conference* (pp. 1215-1217). Atlanta, GA, USA: Association for the Advancement of Computing in Education (AACE). Retrieved August 28, 2020 from https://www.learntechlib.org/primary/p/13636/ .

The significance of interactivity, learning cycle, and content knowledge in science teaching and teacher preparation programs

Summary: This is a theoretical paper that focuses on the significance of interactivity, learning cycle, and content knowledge in the context of science teaching and teacher preparation programs.

Kahveci M. (2003). International Conference of Association for the Education of Teachers of Science (AETS).

Citation

Kahveci M. (2003). *The significance of interactivity, learning cycle, and content knowledge in science teaching and teacher preparation programs*. Paper presented at the International Conference of Association for the Education of Teachers of Science (AETS). St. Louis Hyatt at Union Station, Missouri, USA. January 29 - February 2, 2003.

Micro-patterning of reaction arrays for self-organizing systems

Summary: Recent advances in the photolithographic fabrication of micro-patterned elastomers open intriguing possibilities for the study of chemical self-organization in spatially structured reaction systems and coupled reactor arrays. Here, we present several procedures for the preparation of micro-patterned matrices for the Belousov-Zhabotinsky (BZ) reaction and discuss their relative merits and limitations.

Kahveci M, Hamik C, Steinbock O. (2002). American Chemical Society (ACS).

These experimental strategies involve the use of photo-resist masters (SU-8) and poly(dimethylsiloxane) (PDMS) molds as well as the filling of the molds with aqueous reaction solutions. All of our experiments are carried out with the 1,4-cyclohexanedione-bromate-ferroin BZ system. This system is highly suitable for the use in micro-patterned reactor arrays because the reaction does not involve the formation of gaseous products that could give rise to undesired bubbles. In particular, we discuss the propagation and the interaction of constant-speed oxidation waves in different width sizes of linear channels as well as in a cone shape channel of excitable CHD-BZ medium. Experiments performed in capillary tubes ranging from 2 μm to 1200 μm have shown that there is no size dependence on velocities of oxidation waves. On the contrary, the oxidation waves traveled with different velocities inside the micro reactor arrays in PDMS due to the high bromine diffusion into the PDMS compared to glass capillary. Bromine acts as an inhibitor for BZ reaction reducing the velocity of oxidation waves. Furthermore, the micro reactor arrays provide a better approximation for one spatial dimension for the BZ system, which is easier to simulate.

Citation

Kahveci M, Hamik C, & Steinbock O. (2002). *Micro-patterning of reaction arrays for self-organizing systems*. Paper presented at the American Chemical Society (ACS), 223(393-PHYS), Part 2 (Poster). Orlando, USA. April 7 - 11, 2002.

Letting teachers to interact with the idea of Interactivity: 'What is Interactive?'

Summary: This report is the findings of the research on Interactivity, to find the possible characteristics, contexts, limitations, and ideals, of Interactive Learning Environments for future mathematics and science education areas respectively.

Cezikturk O, Cirik G, Kahveci M. (2001). Society for Information Technology and Teacher Education (SITE).

A web-based survey was used to gather data on diverse views of the academicians, researchers, and teachers. With the help of their answers and our own questioning, we were able to come up with a four-leave model for Interactivity, with social, intellectual, technical, and physical dimensions constituting the four leaves. We hope that this research would give an idea to teachers for what they should expect from “Interactivity” or not.

Citation

Cezikturk O, Cirik G, & Kahveci M (2001). Letting teachers to interact with the idea of “Interactivity”: What is “Interactive?”. In J. Price, D. Willis, N. Davis & J. Willis (Eds.), *Proceedings of SITE 2001–Society for Information Technology & Teacher Education International Conference* (pp. 1070-1071). Norfolk, VA: Association for the Advancement of Computing in Education (AACE). Retrieved August 28, 2020 from https://www.learntechlib.org/primary/p/16872/

An on-line evaluation system for curriculum materials development

Summary: This study presents an early stage online survey to conduct the summative evaluation of EcoVentures software.

Kahveci M. (2000). International Conference on College Teaching & Learning.

Citation

Kahveci M. (2000). *An on-line evaluation system for curriculum materials development*. Paper presented at the International Conference on College Teaching & Learning. Jacksonville, Florida, USA. April 12 - 15, 2000.

Interactivity in mathematics and science education

Summary: Research says that "Interactivity" is a messy idea that takes its meaning from a system of metaphysical oppositions. These oppositions range from learner control issue to the debate.

Cezikturk O, Kahveci M, Cirik G. (2000). International Conference on Mathematics/Science Education and Technology (M/SET).

Today, interactivity is seen as a key factor for achieving effective learning environments. Research says that “Interactivity” is a messy idea that takes its meaning from a system of metaphysical oppositions. These oppositions range from learner control issue to the debate. A group of academicians and researchers were asked to imagine a “Richly Interactive Learning Environment” to the fullest degree possible. The commonalities and differences in their ideas are investigated in order to come up with a shared understanding of interactivity for the new millennium. The aim of this article, is to both deconstruct and reconstruct a theory for interactivity with some real ground from previous research, ideas from that group, and from the ideas of the authors, as a whole. With this framework in hand, we hope that it will be possible to differentiate the real promises of “interactivity” from the wonderland promises.

Citation

Cezikturk O, Kahveci M, & Cirik G. (2000). Interactivity in mathematics and science education. In *Proceedings of International Conference on Mathematics / Science Education and Technology 2000* (pp. 106-111). Association for the Advancement of Computing in Education (AACE). Retrieved August 26, 2020 from https://www.learntechlib.org/primary/p/15425/ .

Team Overview

Summary: List of our group members including the alumni. Each contributing member has a short biography page to navigate.

Group Members

Name	Position	Duration
Murat Kahveci	Principal Investigator	2005 - Present
Ajda Kahveci	Research Collaborator	2005 - Present
Lihua Jin	Research Collaborator	2017 - Present
Timothy French	Research Collaborator	2017 - Present
Yousif Muten	Graduate Student	2020-Present

Alumni

Name	Position	Duration
Basak Oztekin	Graduate Student	2006 - 2007
Elif Algedik	Graduate Student	2006 - 2007
Sirin Coskun	Graduate Student	2006 - 2007
Rukiye Didem Taylan	Graduate Student	2006 - 2007
Yesim Imamoglu	Graduate Student	2006 - 2007
Kerstin Kremer	Research Collaborator	2010 - 2013
Annemarie Kegler	Visiting Graduate Student	Spring 2010
MaryKay Orgill	Co-Editor	2012 - 2015
Maher Mohammed Alarfaj	Research Collaborator	2012 - 2017
Nasser Mansour	Research Collaborator	2012 - 2017

Murat Kahveci

Summary: Principal Investigator (2005 - Present). Ph.D. (2005), MS. (2003), M.S. (2001), Florida State University, Tallahassee, FL.

Curriculum Vitae

Contact Info

Email Facebook Twitter Google Scholar LinkedIn

Research Interests

In the fields of Chemistry Education Research (CER) and Secondary Science Education, Dr. Kahveci works on affective dimensions, psychometric measurements, educational technology, instructional interactivity, and conceptual learning. His research group at DePaul University mainly utilizes quantitative methodologies and advanced inferential statistics techniques. Latest developments in these areas are posted to the blog and publications sections.

Education

- Ph.D. in Science Education (2005), awarded by Florida State University, Tallahassee, FL
- M.S. in Physical Chemistry (2003), awarded by Florida State University, Tallahassee, FL
- M.S. in Science Education (2001), awarded by Florida State University, Tallahassee, FL
- B.S. in Chemistry Education (1997), awarded by Gazi University, Ankara

Licensure

- Professional Educator License (2018–2024), awarded by Illinois State Board of Education

Work Experience

- Teaching Assistant Professor of Chemistry Education (Dec 2016 – Present)
    - Department of Chemistry and Biochemistry
    - DePaul University, Chicago
- Adjunct Professor of Chemistry Education (Aug 2017 – Aug 2019)
    - Department of Biological, Physical and Health Sciences
    - Roosevelt University, Chicago
- Adjunct Professor of Chemistry Education (Jan 2019 – Jun 2019)
    - Department of Physical Sciences and Engineering
    - City Colleges of Chicago, Chicago
- Associate Professor of Chemistry Education (Feb 2008 – Aug 2016)
    - Department of Secondary Schools Science and Mathematics Education
    - Çanakkale Onsekiz Mart University, Çanakkale
- Senior Researcher and Evaluation Associate (Dec 2006 - Jan 2008)
    - Center for Mathematics and Science Education
    - University of Chicago, Chicago
- Dr. Lecturer (Sep 2005 - Jan 2007)
    - Department of Secondary Schools Science and Mathematics Education
    - Bosphorus University, Istanbul
- Program Specialist (Mar 2004 - Aug 2005)
    - Southeast Eisenhower Regional Consortium for Mathematics and Science Education (SERC)
    - SERVE, Tallahassee
- Research/Teaching Assistant (Jun 2000 - May 2003)
    - Department of Chemistry and Biochemistry
    - Florida State University, Tallahassee

Short Term Appointments

- Independent Expert (2012)
    - Served as the member of the expert team assigned by DG Research & Innovation of the European Commission.
    - Technopolis Group, Fraunhofer ISI and Science-Metrix, Brussels

- Independent Expert Evaluator (2010)
    - Reviewed grant proposals submitted to FP7 Science in Society 2010-1 and FP7 Science in Society Program 2010-CAREERS at European Union.
    - European Union, Brussels
- Independent Expert Evaluator (2009)
    - Reviewed grant proposals submitted to FP7 Science in Society 2009-1: Innovative Methods in Science Education Program at European Union.
    - European Union, Brussels
- Independent Expert Evaluator (2008)
    - Reviewed grant proposals submitted to FP7 Science in Society 2008-1: Innovative Methods in Science Education Program at European Union.
    - European Union, Brussels

Projects

9. Affective states and online teaching in chemistry education (2020 - Present)

8. Alternative assessment method in biochemistry education: Graphical representation of oxygen binding and delivery (2017 - 2018)

7. Integrating learning objects into D2L to promote student learning of difficult scientific concepts (2017 - 2018)

6. Impact of instructional interactivity in chemistry education (2015 - 2016)

5. Workshop for in-service science teachers (January 2014)

4. Pedagogical discontentment and self-efficacy of science teachers (2013 - 2015)

3. Physical chemistry education and learning objects (2012 - 2014)

2. Applying research on science materials implementation: Bringing measurement of fidelity of implementation (FOI) to scale (2007 - 2008)

1. EcoVentures: Focus on the Gulf (2000 - 2001)

Publications

Books

60. Kahveci M, & Orgill MK. (Eds.). (2015). *Affective dimensions in chemistry education*. Berlin Heidelberg: Springer-Verlag. doi: 10.1007/978-3-662-45085-7 .

59. Kahveci M. (2015). *Majors' gender-based affective states toward learning physical chemistry*. In M Kahveci, & M Orgill (Eds.). *Affective dimensions in chemistry education* (pp. 297–318). Berlin Heidelberg: Springer-Verlag. doi: 10.1007/978-3-662-45085-7 .

58. Kahveci M. (2009). *Shared perceptions of professors about instructional interactivity*. Saarbrücken: VDM Verlag Dr. Müller.

57. Kahveci M. (2005). *The perceptions of professors at colleges of education about instructional interactivity*. Doctoral dissertation, Florida State University, Tallahassee, Florida, USA.

56. Kahveci M. (2003). *Microdevice fabrication by softlithography and nonlinear phenomena in microchannels*. Master's thesis, Florida State University, Tallahassee, Florida, USA.

55. Kahveci M. (2001). *The summative evaluation of the EcoVentures program in terms of its interactivity component*. Master's thesis, Florida State University, Tallahassee, Florida, USA.

Journal Articles

54. Muten Y, & Kahveci M. (working). Dominant modalities of remote learning in chemistry education.

53. Kahveci A, Kahveci M, Mansour N, & Alarfaj MM. (2018). Exploring science teachers' affective states: Pedagogical discontentment, self-efficacy, intentions to reform, and their relationships. *Research in Science Education, 48*(6), 1359–1386.

52. Kahveci M, Kahveci A, Mansour N, & Alarfaj M. (2016). Construct validity and reliability measures of scores from the Science Teachers' Pedagogical Discontentment (STPD) scale. *Eurasia Journal of Mathematics, Science & Technology Education, 12*(3), 549-558.

51. Kahveci M, & Imamoglu Y. (2014). Re-analysis of PISA 2003 data about students' mathematics anxiety, self-efficacy, and motivation. *Journal of Research in Education and Society, 1*(1), 1-22.

50. Kahveci M, & Imamoglu Y. (2014). Use of technology and attitudes towards technology: An international analysis of the PISA 2003 data. *Journal of Research in Education and Society, 1*(1), 45-63.

49. Southerland SA, Saka Y, Nadelson L, Kahveci M, Sowell S, & Granger EM. (2012). Measuring one aspect of teachers' affective states: Development of the science teachers' pedagogical discontentment scale. *School Science and Mathematics, 112*(8), 483-494.

48. Kahveci M. (2010). Students' perceptions to use technology for learning: Measurement integrity of the modified Fennema-Sherman attitudes scales. *Turkish Online Journal of Educational Technology, 9*(1), 185- 201.

47. Kahveci M. (2007). An instrument development: Interactivity Survey (IS). *Journal of Educational Technology & Society, 10*(3), 163-174.

46. Kahveci M, & Imamoglu Y. (2007). Interactive learning in mathematics education: Review of recent literature. *Journal of Computers in Mathematics and Science Teaching, 26*(2), 137-153.

45. Kahveci M. (2006). Instructional interactivity endeavor and Spiral Dynamics. *Bogazici University Journal of Education, 20*(1), 11-24.

44. Ginn BT, Steinbock B, Kahveci M, & Steinbock O. (2004). Microfluidic devices for the Belousov-Zhabotinsky reaction. *Journal of Physical Chemistry A, 108*, 1325-1332.

Conference Papers

43. Kahveci M, & Jin L. (2018). *Measuring conceptual understanding on oxygen binding and delivery in a biochemistry course*. Paper presented at Biennial Conference on Chemical Education (BCCE). Notre Dame, IN, USA. July 29 – August 2, 2018.

42. Kahveci M, & French T. (2017). *Integrating learning objects into D2L to promote student learning of difficult scientific concepts*. Paper presented at DePaul University Teaching and Learning Conference. Chicago, IL, USA. May 5, 2017.

41. Kahveci M, & Jin L. (2017). *Alternative assessment method in biochemistry education: Graphical representation of oxygen binding and delivery*. Paper presented at DePaul University Teaching and Learning Conference. Workshop. Chicago, IL, USA. May 5, 2017.

40. Kahveci M. (2016). *Advancing chemistry education research: Dual-Process Theories, Learning Objects and Student Response Systems* (**Keynote Lecture**). Paper presented at the European Conference on Research in Chemical Education (ECRICE), Barcelona. September 7 – 10, 2016.

39. Kahveci M. (2015). *A project idea on working definition of IBSE in Europe through artificial intelligence*. Paper presented at the European Commission and SiS.net. (Brokerage Event). Brussels, Belgium. May 22, 2015.

38. Kahveci M. (2015). *A project idea on working definition of IBSE in Europe through artificial intelligence*. Paper presented at the IOSTE Eurasian Regional Symposium and Brokerage Event Horizon 2020, Istanbul, Turkey. April 24 – 26, 2015.

37. Kahveci M, Kahveci A, Mansour N, & Alarfaj MM. (2015). *Construct validity and reliability measures of scores from the Science Teachers' Pedagogical Discontentment (STPD) Scale*. Paper presented at the National Association for Research in Science Teaching International Conference (NARST). Chicago, IL, USA. April 11 - 14, 2015.

36. Kahveci M. (2015). *Affective factors and instructional interactivity in education*. Paper presented at the Association of Private Schools Society in Turkey. Kaya Plazzo Hotel, Antalya, Turkey. January 28 - 31, 2015.

35. Kahveci M. (2015). *Introduction to Moodle Learning Management System and use of learning objects*. Paper presented at the Association of Private Schools Society in Turkey. [Workshop]. Kaya Plazzo Hotel, Antalya, Turkey. January 28 - 31, 2015.

34. Kahveci M. (2015). *An account for Inquiry-Based Science Education through Dual-Process Theories*. Paper presented at European Science Education Research Association (ESERA). Helsinki, Finland. August 31 - September 4, 2015.

33. Kahveci M. (2014). *Affective dimensions in chemistry education: Focus on educational technology and learning objects*. Paper presented at the Biennial Conference on Chemical Education (BCCE). [Symposium]. Grand Valley State University, Allendale, MI, U.S.A. Au- gust 3 - 7, 2014.

32. Kahveci M. (2013). *Phase diagrams and conceptual learning*. Paper presented at the National Chemistry Education Conference (UKEK). Karadeniz Technical University, Trabzon, Turkey. September 5 - 7, 2013.

31. Kahveci M. (2013). *Preparing a grant proposal for funding by the European Commission and presenting a grant proposal in chemistry education*. Paper presented at the National Chemistry Education Conference (UKEK). [Workshop]. Karadeniz Technical University, Trabzon, Turkey. September 5 - 7, 2013.

30. Kahveci M. (2013). *Experiences in reviewing proposals under FP7 Program and some tips for improving proposals*. Paper presented at the CARPE Conference. Manchester Metropolitan University, Manchester, UK. November 4 - 6, 2013.

29. Kahveci M. (2013). *Adaptation of learning objects to inquiry-based chemical education: Phase diagrams*. Paper presented at the National Chemistry Education Conference (UKEK). Karadeniz Technical University, Trabzon, Turkey. September 5 - 7, 2013.

28. Kahveci M. (2012). *Affective dimensions in chemistry education*. Paper presented at the Biennial Conference on Chemical Education (BCCE). [Symposium]. Pennsylvania State University, University Park, PA, USA. July 29 - August 2, 2012.

27. Kahveci M. (2012). *Physical chemistry education and learning objects (PChemLO): Affective aspects of implementation*. Paper presented at the Biennial Conference on Chemical Education (BCCE). Pennsylvania State University, University Park, PA, USA. July 29 - August 2, 2012.

26. Kahveci M. (2012). *Physical chemistry education and learning objects (PChemLO): A technological implementation to foster inquiry-based learning and diminish gender differences at higher education*. Paper presented at the 21st Symposium on Chemical and Science Education. [Poster]. TU Dortmund University, Dortmund, Germany. May 17-19, 2012.

25. Kahveci M. (2012). *Affective dimensions in chemistry education: Much left for future research*. Paper presented at the Biennial Conference on Chemical Education (BCCE). Pennsylvania State University, University Park, PA, USA. July 29 - August 2, 2012.

24. Kegler A, Kahveci M, & Kremer K. (2012). *Einstellungen zur Chemie und zum Chemielernen bei türkischen und deutschen Jugendlichen*. Paper presented at the Jahrestagung der Gesellschaft für Didaktik der Chemie und Physik (GDCP). [Poster]. Leibniz- Universität, Hannover, Germany. September 17 - 20, 2012.

23. Kahveci M. (2011). *Depicting chemistry majors' self-perceptions in learning chemistry*. Paper presented at the National Association for Research in Science Teaching (NARST). Orlando, FL, USA. April 3 - 6, 2011.

22. Kahveci M. 2009. *FP7 Science in Society Program: The evaluation process of large scale proposals for coordination and support actions*. Paper presented at the International Conference of Educational Research Association Turkey (EAB). Canakkale, Turkey. May 1 - 3, 2009.

21. Kahveci M. 2009. *Quantifying high school students' self- perceptions in learning chemistry*. Paper presented at the National Association for Research in Science Teaching (NARST). Garden Grove, CA, USA. April 17 - 21, 2009.

20. Kahveci M. (2009). *Analysis of Turkish high-school chemistry examination questions according to Bloom's Taxonomy*. Paper presented at the International Conference of Educational Research Association Turkey (EAB). Canakkale, Turkey. May 1 - 3, 2009.

19. Kahveci M, Coskun S, & Taylan RD. (2008). *Students' motivation to use technology for learning*. Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications (ED-MEDIA). Vienna, Austria. June 30 - July 4, 2008.

18. Century J, Rudnick M, Freeman C, Isaacas A, Leslie D, & Kahveci M. (2008). *A conceptual framework for fidelity of implementation of instructional materials*. Paper presented at the American Educational Research Association (AERA). New York, USA. March 24 - 28, 2008.

17. Century J, Rudnick M, Freeman C, Leslie D, Kahveci M, & Isaacs A. (2008). *A framework for measuring fidelity of implementation of science instructional materials*. Paper presented at the National Association for Research in Science Teaching (NARST). Baltimore, USA. March 30 - April 2, 2008.

16. Kahveci M. (2007). *Investigating the existence of interactivity in various instructional settings*. Paper presented at the National Association for Research in Science Teaching (NARST). New Orleans, USA. April 15 - 18, 2007.

15. Southerland SA, Sowell S, Kahveci M, Granger EM, & Saka, Y. (2007). *A finer grain understanding of teachers' adoption of reforms?: Development of an instrument to assess science teachers' pedagogical discontentment (STPD)*. Paper presented at the National Association for Research in Science Teaching (NARST). New Orleans, USA. April 15 - 18, 2007.

14. Kahveci, M. & Imamoglu, Y. (2007). Interactive Learning in Mathematics Education: Review of Recent Literature. In R. Carlsen, K. McFerrin, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of SITE 2007–Society for Information Technology & Teacher Education International Conference* (pp. 3269-3276). San Antonio, Texas, USA: Association for the Advancement of Computing in Education (AACE). Retrieved August 30, 2020 from https://www.learntechlib.org/primary/p/25115/ .

13. Kahveci, M. (2007). An instrument development: Interactivity Survey (the IS). In R. Carlsen, K. McFerrin, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of SITE 2007—Society for Information Technology & Teacher Education International Conference* (pp. 809-819). San Antonio, Texas, USA: Association for the Advancement of Computing in Education (AACE). Retrieved August 30, 2020 from https://www.learntechlib.org/primary/p/24650/ .

12. Southerland SA, Sowell S, Kahveci M, Granger EM, & Owen OF. (2006). *Working to measure the impact of professional development activities: Developing an instrument to quantify pedagogical discontentment*. Paper presented at the National Association for Research in Science Teaching (NARST). San Francisco, USA. April 4 - 7, 2006.

11. Kahveci M, & Imamoglu Y. (2006). *Turkish high-school students' attitudes toward learning mathematics*. Paper presented at the International Conference on the Teaching of Mathematics (ICTM). Istanbul, Turkey. June 30 - July 5, 2006.

10. Kahveci M, Oztekin B, & Algedik E. (2006). *Matematiği öğrenmede kendi-kendini kavrama*. Paper presented at the 7. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi. Gazi University, Ankara, Turkey. September 7 - 9, 2006.

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8. Kahveci M & Kahveci A (2004). The significance of interactivity in gender equitable education. In R. Ferdig, C. Crawford, R. Carlsen, N. Davis, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of SITE 2004–Society for Information Technology & Teacher Education International Conference* (pp. 1218-1220). Atlanta, GA, USA: Association for the Advancement of Computing in Education (AACE). Retrieved August 28, 2020 from https://www.learntechlib.org/primary/p/13637/ .

7. Kahveci, M. (2004). The use of interactivity in a graduate class: A case study. In R. Ferdig, C. Crawford, R. Carlsen, N. Davis, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of SITE 2004–Society for Information Technology & Teacher Education International Conference* (pp. 1221-1223). Atlanta, GA, USA: Association for the Advancement of Computing in Education (AACE). Retrieved August 28, 2020 from https://www.learntechlib.org/primary/p/13638/ .

6. Kahveci A & Kahveci M (2004). Instructional interactivity and technology components of a freshman chemistry course. In R. Ferdig, C. Crawford, R. Carlsen, N. Davis, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of SITE 2004–Society for Information Technology & Teacher Education International Conference* (pp. 1215-1217). Atlanta, GA, USA: Association for the Advancement of Computing in Education (AACE). Retrieved August 28, 2020 from https://www.learntechlib.org/primary/p/13636/ .

5. Kahveci M. (2003). *The significance of interactivity, learning cycle, and content knowledge in science teaching and teacher preparation programs*. Paper presented at the International Conference of Association for the Education of Teachers of Science (AETS). St. Louis Hyatt at Union Station, Missouri, USA. January 29 - February 2, 2003.

4. Kahveci M, Hamik C, & Steinbock O. (2002). *Micro-patterning of reaction arrays for self-organizing systems*. Paper presented at the American Chemical Society (ACS), 223(393-PHYS), Part 2 (Poster). Orlando, USA. April 7 - 11, 2002.

3. Cezikturk O, Cirik G, & Kahveci M (2001). Letting teachers to interact with the idea of "Interactivity": What is "Interactive?". In J. Price, D. Willis, N. Davis & J. Willis (Eds.), *Proceedings of SITE 2001–Society for Information Technology & Teacher Education International Conference* (pp. 1070-1071). Norfolk, VA: Association for the Advancement of Computing in Education (AACE). Retrieved August 28, 2020 from https://www.learntechlib.org/primary/p/16872/

2. Kahveci M. (2000). *An on-line evaluation system for curriculum materials development*. Paper presented at the International Conference on College Teaching & Learning. Jacksonville, Florida, USA. April 12 - 15, 2000.

1. Cezikturk O, Kahveci M, & Cirik G. (2000). Interactivity in mathematics and science education. In *Proceedings of International Conference on Mathematics / Science Education and Technology 2000* (pp. 106-111). Association for the Advancement of Computing in Education (AACE). Retrieved August 26, 2020 from https://www.learntechlib.org/primary/p/15425/ .

Courses

45. CHE 134 ▷ General Chemistry III ▷ DePaul University ▷ Autumn 2020

44. CHEM 135 ▷ General Chemistry III Lab ▷ DePaul University ▷ Autumn 2020, Spring 2020, Autumn 2019, Autumn 2017, Summer 2017

43. CHEM 131 ▷ General Chemistry I Lab ▷ DePaul University ▷ Autumn 2020, Winter 2020, Autumn 2019, Autumn 2018, Winter 2017, Autumn 2017

42. CHEM 139 ▷ General Chemistry II Lab ▷ DePaul University ▷ Summer 2020

41. CHE 497 ▷ Research ▷ DePaul University ▷ Spring 2020

40. CHE 132 ▷ General Chemistry II ▷ DePaul University ▷ Spring 2020, Winter 2020

39. CHEM 133 ▷ General Chemistry II Lab ▷ DePaul University ▷ Spring 2020, Winter 2020, Winter 2018, Winter 2017

38. CHE 120 ▷ General Chemistry IP ▷ DePaul University ▷ Autumn 2019

37. CHE/FYSC 128 ▷ Basic Chemical Concepts ▷ DePaul University ▷ Summer 2019, Summer 2018

36. CHE/FYSC 129 ▷ Basic Chemical Concepts Lab ▷ DePaul University ▷ Summer 2019, Summer 2018

35. PHSC 105 ▷ Introduction to Environmental Science ▷ Roosevelt University ▷ Spring 2019

34. PHSC 107 ▷ How the World Works ▷ Roosevelt University ▷ Spring 2019

33. CHEM 121 ▷ Basic Chemistry I ▷ City Colleges of Chicago Richard J. Daley College ▷ Spring 2019

32. CHEM 205 ▷ Analytical Chemistry Lab ▷ DePaul University ▷ Autumn 2018

31. BCHM 320/420 ▷ Physical Chemistry for Biosciences ▷ Roosevelt University ▷ Fall 2018

30. CHEM 100 ▷ Foundations of Chemistry ▷ Roosevelt University ▷ Fall 2018

29. CHEM 201A ▷ General Chemistry I ▷ Roosevelt University ▷ Summer 2018

28. CHEM 201B ▷ General Chemistry I Lab ▷ Roosevelt University ▷ Summer 2018

27. CHEM 322A/422A ▷ Physical Chemistry II (Quantum Mechanics) ▷ Roosevelt University ▷ Spring 2018

26. CHEM 322B/422B ▷ Physical Chemistry II Lab (Computational) ▷ Roosevelt University ▷ Spring 2018

25. LSP 120 ▷ Quantitative Reasoning and Technological Literacy I ▷ DePaul University ▷ Winter 2018, Winter 2017, Spring 2017

24. CHEM 321A/421A ▷ Physical Chemistry I (Thermodynamics) ▷ Roosevelt University ▷ Fall 2017

23. CHEM 321B/421B ▷ Physical Chemistry I Lab ▷ Roosevelt University ▷ Fall 2017

22. KIMEG 5023 ▷ Introductory Statistics ▷ Çanakkale Onsekiz Mart University ▷ Fall 2015

21. KIMEG 5023 ▷ Teaching of Nature of Science ▷ Çanakkale Onsekiz Mart University ▷ Fall 2015

20. EGYD 5010 ▷ Scientific Research Method and Statistics ▷ Çanakkale Onsekiz Mart University ▷ Spring 2015

19. KIMEG 5020 ▷ Theory and Practice of Qualitative Research ▷ Çanakkale Onsekiz Mart University ▷ Fall 2014, Spring 2014

18. FM 526 ▷ Applied Research ▷ Çanakkale Onsekiz Mart University ▷ Spring 2014

17. 14FBÖ118 ▷ General Chemistry II ▷ Çanakkale Onsekiz Mart University ▷ Spring 2014, Spring 2013, Spring 2011

16. AFEY 5006 ▷ Quantitative Research Methods and Statistic ▷ Çanakkale Onsekiz Mart University ▷ Spring 2014

15. 14FEN125 ▷ General Chemistry I ▷ Çanakkale Onsekiz Mart University ▷ Fall 2012, Fall 2011, Fall 2010

14. 16KMO410 ▷ Educational Technology and Material Design ▷ Çanakkale Onsekiz Mart University ▷ Summer 2011, Spring 2011

13. FM 520 ▷ Practice Teaching in Chemistry ▷ Çanakkale Onsekiz Mart University ▷ Fall 2011

12. EF 307 ▷ Statistics and Probability ▷ Çanakkale Onsekiz Mart University ▷ Fall 2010

11. EF 303 ▷ Special Topics in Physics Education ▷ Çanakkale Onsekiz Mart University ▷ Fall 2010

10. ULP-01-504 ▷ Research Methods in Education ▷ Çanakkale Onsekiz Mart University ▷ Fall 2010

9. EF 313 ▷ Research Methods in Science Education ▷ Çanakkale Onsekiz Mart University ▷ Fall 2008

8. EF 305 ▷ Special Topics in Chemistry Education ▷ Çanakkale Onsekiz Mart University ▷ Fall 2008

7. SCED 404 ▷ Applied Research in Science and Mathematics Education ▷ Boğaziçi University ▷ Fall 2006, Spring 2006, Fall 2005

6. SCED 498 ▷ Special Studies: Applied Research in Education ▷ Boğaziçi University ▷ Fall 2006, Spring 2006

5. SCED 598 ▷ Qualitative Research in Science and Mathematics Education ▷ Boğaziçi University ▷ Fall 2006

4. SCED 420 ▷ Teaching Methods in Science and Mathematics Education ▷ Boğaziçi University ▷ Fall 2006, Summer 2006, Fall 2005

3. SCED 360 ▷ Secondary School Science Laboratory Applications II ▷ Boğaziçi University ▷ Spring 2006

2. SCED 418 ▷ Seminar on Practice Teaching in Physics ▷ Boğaziçi University ▷ Spring 2006

1. SCED 441 ▷ Teaching Methods in Physics Education ▷ Boğaziçi University ▷ Fall 2005

Posts

16. Installing a Learning Object to the D2L Environment ▷ August 13, 2020
This tutorial demonstrates how to import and use a learning object prepared in SCORM 1.2 standards.

15. Request for Letter of Recommendation ▷ August 05, 2020
Excellent students who have worked in my research group and who have received a high grade in my classes will be able to ask for recommendation letters for g…

14. ‘Thank you’ from Andres ▷ June 03, 2020
I just wanted to extend a sincere thank you to you and the entire Chemistry department, including our TA’s, for your compassion and understanding during thes…

13. D2L Submission Folder Setup with a Rubric ▷ April 13, 2020
This tutorial demonstrates how to set up a Submission folder with commenting capabilities and with as associated rubric for assessment.

12. Tools ▷ April 11, 2020
Useful tools for online teaching.

11. Low Cost Options for Document Cameras ▷ April 11, 2020
If you need to write equations, etc during a Zoom lecture, a low cost document camera is useful to have – you can select it as a source in Zoom. Here are a c…

10. Deferments or Cancellations of Events due to COVID-19 ▷ April 06, 2020
Unfortunately nowadays we hear all international conferences are being cancelled or postponed in response to the COVID-19 pandemic.

9. Forums in D2L ▷ April 05, 2020
This tutorial describes a method to implement group-based forums.

8. ‘Chemistry’ from Madison ▷ March 24, 2020
I just wanted to say thank you for being an awesome chemistry teacher the past 2 classes. You truly are amazing and one of the best. I had to take chemistry …

7. I Will Survive, Coronavirus version of teachers going online ▷ March 19, 2020
“Kept trying hard to mend the pieces of my syllabi And I spent so many nights just feeling sorry for myself I used to cry But now I hold my head up high &…

6. Higher Education in Science and Engineering ▷ September 08, 2019
This report is prepared by the National Science Board.

5. Affective Dimensions in Chemistry Education ▷ September 07, 2019
ADCE’s recent stats from Springer.

4. New paper published by RISE ▷ December 30, 2018
As of 25 December 2018, our paper was published in the completed RISE issue.

3. Critical Chemistry ▷ December 15, 2018
Critical Chemistry: The Science of Saving Lives is a new online, adaptive introductory level chemistry smart course.

2. Connected Science Learning ▷ December 14, 2018
Last week’s release of the federal government’s STEM Education Strategic Plan specifically calls for more blended STEM learning practices across learning lan…

1. BCCE 2018 ▷ August 05, 2018
We presented at 2018 Biennial Conference on Chemical Education hosted by the University of Notre Dame.

Hobbies

Dr. Kahveci is a runner and road-biker . Since Jan 2019, he has been doing strength training . He has been playing chess since his childhood.

Ajda Kahveci

Summary: Research Collaborator (2005 - Present). Dr. Ajda Kahveci earned a PhD in Science Education with specialization in Chemistry Education from Florida State University in 2005.

Contact Info

Email Google Scholar ResearchGate

Biography

Dr. Ajda Kahveci earned a PhD in Science Education with specialization in Chemistry Education from Florida State University in 2005. She has published research in her areas of interest in leading science and chemistry education journals, authored book chapters and co-authored secondary level chemistry textbooks. Her research interests include gender equity in science education, inquiry methods in science teaching, and pre-service chemistry teacher education. Currently, she is Associate Editor of the Chemistry Education Research and Practice journal published by the Royal Society of Chemistry.

Joint Projects

Please note that this page includes only joint projects with the kahveci group. Ajda Kahveci's webpage would probably have the complete list of projects.

1. Pedagogical discontentment and self-efficacy of science teachers (2013 - 2015)

Joint Publications

Please note that this page includes only joint publications with the kahveci group. Ajda Kahveci's webpage would probably have the complete list of publications.

Journal Articles

5. Kahveci A, Kahveci M, Mansour N, & Alarfaj MM. (2018). Exploring science teachers' affective states: Pedagogical discontentment, self-efficacy, intentions to reform, and their relationships. *Research in Science Education, 48*(6), 1359–1386.

4. Kahveci M, Kahveci A, Mansour N, & Alarfaj M. (2016). Construct validity and reliability measures of scores from the Science Teachers' Pedagogical Discontentment (STPD) scale. *Eurasia Journal of Mathematics, Science & Technology Education, 12*(3), 549-558.

Conference Papers

3. Kahveci M, Kahveci A, Mansour N, & Alarfaj MM. (2015). *Construct validity and reliability measures of scores from the Science Teachers' Pedagogical Discontentment (STPD) Scale*. Paper presented at the National Association for Research in Science Teaching International Conference (NARST). Chicago, IL, USA. April 11 - 14, 2015.

2. Kahveci M & Kahveci A (2004). The significance of interactivity in gender equitable education. In R. Ferdig, C. Crawford, R. Carlsen, N. Davis, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of SITE 2004–Society for Information Technology & Teacher Education International Conference* (pp. 1218-1220). Atlanta, GA, USA: Association for the Advancement of Computing in Education (AACE). Retrieved August 28, 2020 from https://www.learntechlib.org/primary/p/13637/ .

1. Kahveci A & Kahveci M (2004). Instructional interactivity and technology components of a freshman chemistry course. In R. Ferdig, C. Crawford, R. Carlsen, N. Davis, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of SITE 2004–Society for Information Technology & Teacher Education International Conference* (pp. 1215-1217). Atlanta, GA, USA: Association for the Advancement of Computing in Education (AACE). Retrieved August 28, 2020 from https://www.learntechlib.org/primary/p/13636/ .

Lihua Jin

Summary:
Research Collaborator (2017 - Present)

Dr. Lihua Jin received her B.S. (1984) and M.S. (1987) in Chemistry from Fudan University in China and her Ph.D. (1996) from Princeton University.

Contact Info

Email

Biography

Dr. Lihua Jin received her B.S. (1984) and M.S. (1987) in Chemistry from Fudan University (page 0) in China and her Ph.D. (1996) from Princeton University . Her Ph.D. and postdoctoral training was on the study of protein structure-function relationships using a variety of biochemical and biophysical techniques including isothermal titration calorimetry (ITC). Her independent research started in 1999 as a faculty member working with undergraduates at the State University of New York College at Geneseo (1999-2002) and later with both undergraduates and M.S. students at DePaul University (2002-present). At SUNY Geneseo her research was focused on the biochemical study of protein-lipid interactions in the context of lipoproteins. At DePaul University her research has been focused on the study of molecular interactions using ITC, specifically interactions involving protein-small molecule, protein-DNA, peptide-metal ions and small molecule-metal ions. Dr. Jin's other research focus is in improving student learning. She has collaborated with Dr. Murat Kahveci (page 0), a chemistry education expert and adjunct faculty of DePaul University , in the creation of two-tier diagnostic instrument to measure biochemistry course taker's conceptual understanding.

Joint Projects

Please note that this page includes only joint projects with the kahveci group. Lihua Jin's webpage would probably have the complete list of projects.

1. Alternative assessment method in biochemistry education: Graphical representation of oxygen binding and delivery (2017 - 2018)

Joint Publications

Please note that this page includes only joint publications with the kahveci group. Lihua Jin's webpage would probably have the complete list of publications.

Conference Papers

2. Kahveci M, & Jin L. (2018). *Measuring conceptual understanding on oxygen binding and delivery in a biochemistry course*. Paper presented at Biennial Conference on Chemical Education (BCCE). Notre Dame, IN, USA. July 29 – August 2, 2018.

1. Kahveci M, & Jin L. (2017). *Alternative assessment method in biochemistry education: Graphical representation of oxygen binding and delivery*. Paper presented at DePaul University Teaching and Learning Conference. Workshop. Chicago, IL, USA. May 5, 2017.

Timothy French

Summary: Research Collaborator (2017 - Present). Dr. Timothy French earned his B.S. (2002) in Chemistry from Rensselaer Polytechnic Institute, and his M.S. (2003) and PhD (2007) in Chemistry with a specialization in chemical physics from Yale University.

Contact Info

Email

Biography

Dr. Timothy French earned his B.S. (2002) in Chemistry from Rensselaer Polytechnic Institute , and his M.S. (2003) and PhD (2007) in Chemistry with a specialization in chemical physics from Yale University . From 2008-2012, he was a non-tenure-track faculty member at Harvard University teaching courses in introductory physics with biological applications and experimental physical chemistry. He has been at DePaul since 2012, where he is currently an Assistant Professor of Chemistry. His research interests relate broadly to interdisciplinary science education.

Joint Projects

Please note that this page includes only joint projects with the kahveci group. Timothy French's webpage would probably have the complete list of projects.

1. Integrating learning objects into D2L to promote student learning of difficult scientific concepts (2017 - 2018)

Joint Publications

Please note that this page includes only joint publications with the kahveci group. Timothy French's webpage would probably have the complete list of publications.

Conference Papers

1. Kahveci M, & French T. (2017). *Integrating learning objects into D2L to promote student learning of difficult scientific concepts*. Paper presented at DePaul University Teaching and Learning Conference. Chicago, IL, USA. May 5, 2017.

Yousif Muten

Summary: Graduate Student (Spring 2020). DePaul University.

Contact Info

Email

Biography

Yousif Muten earned his B.S. in chemistry at Western Carolina University . He is currently a graduate student at the Department of Chemistry and Biochemistry at DePaul University and planning to pursue his doctorate education in the field of chemistry education.

Joint Projects

Please note that this page includes only joint projects with the kahveci group. Yousif Muten's webpage would probably have the complete list of projects.

1. Affective states and online teaching in chemistry education (2020 - Present)

Joint Publications

Please note that this page includes only joint publications with the kahveci group. Yousif Muten's webpage would probably have the complete list of publications.

Journal Articles

1. Muten Y, & Kahveci M. (working). Dominant modalities of remote learning in chemistry education.

Basak Oztekin

Summary: Graduate Student (2006 - 2007). Worked as a student researcher in the Integrated BS/MS program.

Biography

Worked as a student researcher in the Integrated BS/MS program at Bogazici University.

Joint Publications

Please note that this page includes only joint publications with the kahveci group. Basak Oztekin's webpage would probably have the complete list of publications.

Conference Papers

1. Kahveci M, Oztekin B, & Algedik E. (2006). *Matematiği öğrenmede kendi-kendini kavrama*. Paper presented at the 7. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi. Gazi University, Ankara, Turkey. September 7 - 9, 2006.

Elif Algedik

Summary: Graduate Student (2006 - 2007). Worked as a student researcher in the Integrated BS/MS program.

Biography

Worked as a student researcher in the Integrated BS/MS program at Bogazici University.

Joint Publications

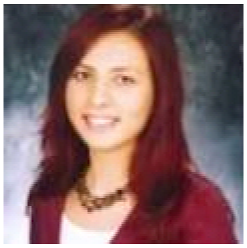
Please note that this page includes only joint publications with the kahveci group. Elif Algedik's webpage would probably have the complete list of publications.

Conference Papers

1. Kahveci M, Oztekin B, & Algedik E. (2006). *Matematiği öğrenmede kendi-kendini kavrama*. Paper presented at the 7. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi. Gazi University, Ankara, Turkey. September 7 - 9, 2006.

Sirin Coskun

Summary: Graduate Student (2006 - 2007). Worked as a student researcher in the Integrated BS/MS program.



Biography

Worked as a student researcher in the Integrated BS/MS program at Bogazici University. Dr. Sirin Coskun is currently employed as a professor of mathematic education at the University of Wisconsin Stevens Point .

Joint Publications

Please note that this page includes only joint publications with the kahveci group. Sirin Coskun's webpage would probably have the complete list of publications.

Conference Papers

1. Kahveci M, Coskun S, & Taylan RD. (2008). *Students' motivation to use technology for learning*. Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications (ED-MEDIA). Vienna, Austria. June 30 - July 4, 2008.

Rukiye Didem Taylan

Summary: Graduate Student (2006 - 2007). Worked as a student researcher in the Integrated BS/MS program.

Biography

Worked as a student researcher in the Integrated BS/MS program at Bogazici University. Dr. Rukiye Didem Taylan is currently employed as a professor of mathematic education at the MEF University .

Joint Publications

Please note that this page includes only joint publications with the kahveci group. Rukiye Didem Taylan's webpage would probably have the complete list of publications.

Conference Papers

1. Kahveci M, Coskun S, & Taylan RD. (2008). *Students' motivation to use technology for learning*. Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications (ED-MEDIA). Vienna, Austria. June 30 - July 4, 2008.

Yesim Imamoglu

Summary: Graduate Student (2006 - 2007). Worked as a doctoral student researcher.

Contact Info

Email

Biography

Worked as a student researcher in the doctoral program at Bogazici University. Dr. Yesim Imamoglu is currently employed as a professor of science and mathematic education at the Bogazici University .

Joint Publications

Please note that this page includes only joint publications with the kahveci group. Yesim Imamoglu's webpage would probably have the complete list of publications.

Journal Articles

5. Kahveci M, & Imamoglu Y. (2014). Re-analysis of PISA 2003 data about students' mathematics anxiety, self-efficacy, and motivation. *Journal of Research in Education and Society, 1*(1), 1-22.

4. Kahveci M, & Imamoglu Y. (2014). Use of technology and attitudes towards technology: An international analysis of the PISA 2003 data. *Journal of Research in Education and Society, 1*(1), 45-63.

3. Kahveci M, & Imamoglu Y. (2007). Interactive learning in mathematics education: Review of recent literature. *Journal of Computers in Mathematics and Science Teaching, 26*(2), 137-153.

Conference Papers

2. Kahveci, M. & Imamoglu, Y. (2007). Interactive Learning in Mathematics Education: Review of Recent Literature. In R. Carlsen, K. McFerrin, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of SITE 2007–Society for Information Technology & Teacher Education International Conference* (pp. 3269-3276). San Antonio, Texas, USA: Association for the Advancement of Computing in Education (AACE). Retrieved August 30, 2020 from https://www.learntechlib.org/primary/p/25115/ .

1. Kahveci M, & Imamoglu Y. (2006). *Turkish high-school students' attitudes toward learning mathematics*. Paper presented at the International Conference on the Teaching of Mathematics (ICTM). Istanbul, Turkey. June 30 - July 5, 2006.

Kerstin Kremer

Summary: Research Collaborator (2010 - 2013). Leibniz-Institut für die Pädagogik der Naturwissenschaften und Mathematik (IPN)

Contact Info

Email

Biography

Dr. Kerstin Kremer is currently employed as a professor of science education at the Leibniz-Institut für die Pädagogik der Naturwissenschaften und Mathematik (IPN) .

Joint Publications

Please note that this page includes only joint publications with the kahveci group. Kerstin Kremer's webpage would probably have the complete list of publications.

Conference Papers

1. Kegler A, Kahveci M, & Kremer K. (2012). *Einstellungen zur Chemie und zum Chemielernen bei türkischen und deutschen Jugendlichen*. Paper presented at the Jahrestagung der Gesellschaft für Didaktik der Chemie und Physik (GDCP). [Poster]. Leibniz- Universität, Hannover, Germany. September 17 - 20, 2012.

Annemarie Kegler

Summary: Visiting Graduate Student (Spring 2010). Visited our group in Spring 2010 and gathered data for her thesis research in chemistry education.

Biography

Visited our group in the summer of 2010 from Justus Liebig University Giessen and gathered data for her thesis research in chemistry education.

Joint Publications

Please note that this page includes only joint publications with the kahveci group. Annemarie Kegler's webpage would probably have the complete list of publications.

Conference Papers

1. Kegler A, Kahveci M, & Kremer K. (2012). *Einstellungen zur Chemie und zum Chemielernen bei türkischen und deutschen Jugendlichen*. Paper presented at the Jahrestagung der Gesellschaft für Didaktik der Chemie und Physik (GDCP). [Poster]. Leibniz- Universität, Hannover, Germany. September 17 - 20, 2012.

MaryKay Orgill

Summary: Co-Editor (2012 - 2015). University of Nevada Las Vegas.

Contact Info

Email

Biography

Dr. MaryKay Orgill is a Professor of Chemistry and Biochemistry at the University of Nevada Las Vegas (UNLV) where her research has mainly focused on examining and improving undergraduate chemistry teaching and learning. She has also been involved in a number of grant projects that have provided professional development workshops and classes to over 500 K-12 teachers and university faculty in order to increase their knowledge of STEM content and of instructional strategies that are effective for teaching STEM subjects. Dr. Orgill established the chemistry education research program at UNLV, mentors graduate students who are doing research about chemistry teaching and learning, and applies the results of the research done in her group to her classroom teaching, for which she has received several teaching awards, including the UNLV GPSA Outstanding Mentor Award and the UNLV Foundation Distinguished Teaching Award. Dr. Orgill is a Fellow of the Royal Society of Chemistry and served as a member of the Chair Succession of the Division of Chemical Education of the American Chemical Society from 2016-2018.

Joint Publications

Please note that this page includes only joint publications with the kahveci group. MaryKay Orgill's webpage would probably have the complete list of publications.

Books

1. Kahveci M, & Orgill MK. (Eds.). (2015). *Affective dimensions in chemistry education*. Berlin Heidelberg: Springer-Verlag. doi: 10.1007/978-3-662-45085-7 .

Maher Mohammed Alarfaj

Summary: Research Collaborator (2012 - 2017). King Faisal University.

Contact Info

Email ResearchGate

Biography

Department of Curricula and Instruction
King Faisal University
P.O. Box: 400
Post Code: 31982
Al Ahsa, Saudi Arabia

Maher Alarfaj, Ph.D. (Ohio University), is a Saudi full professor. His interests lie at the intersection of education, science (particularly neuroscience) and quantitative research. He is interested in contributing to the conceptual frameworks that seek to build bridges between science and social science. He was a Hubert H. Humphrey fellow. He has won grants from international associations, such as the UNESCO. He has 23 years of experience with Saudi and US academia.

Joint Projects

Please note that this page includes only joint projects with the kahveci group. Maher Mohammed Alarfaj's webpage would probably have the complete list of projects.

1. Pedagogical discontentment and self-efficacy of science teachers (2013 - 2015)

Joint Publications

Please note that this page includes only joint publications with the kahveci group. Maher Mohammed Alarfaj's webpage would probably have the complete list of publications.

Journal Articles

3. Kahveci A, Kahveci M, Mansour N, & Alarfaj MM. (2018). Exploring science teachers' affective states: Pedagogical discontentment, self-efficacy, intentions to reform, and their relationships. *Research in Science Education, 48*(6), 1359–1386.

2. Kahveci M, Kahveci A, Mansour N, & Alarfaj M. (2016). Construct validity and reliability measures of scores from the Science Teachers' Pedagogical Discontentment (STPD) scale. *Eurasia Journal of Mathematics, Science & Technology Education, 12*(3), 549-558.

Conference Papers

1. Kahveci M, Kahveci A, Mansour N, & Alarfaj MM. (2015). *Construct validity and reliability measures of scores from the Science Teachers' Pedagogical Discontentment (STPD) Scale*. Paper presented at the National Association for Research in Science Teaching International Conference (NARST). Chicago, IL, USA. April 11 - 14, 2015.

Nasser Mansour

Summary: Research Collaborator (2012 - 2017). University of Exeter.

Contact Info

Email ResearchGate

Biography

Dr. Nasser Mansour is currently employed as a professor of science education at the University of Exeter .

Joint Projects

Please note that this page includes only joint projects with the kahveci group. Nasser Mansour's webpage would probably have the complete list of projects.

1. Pedagogical discontentment and self-efficacy of science teachers (2013 - 2015)

Joint Publications

Please note that this page includes only joint publications with the kahveci group. Nasser Mansour's webpage would probably have the complete list of publications.

Journal Articles

3. Kahveci A, Kahveci M, Mansour N, & Alarfaj MM. (2018). Exploring science teachers' affective states: Pedagogical discontentment, self-efficacy, intentions to reform, and their relationships. *Research in Science Education, 48*(6), 1359–1386.

2. Kahveci M, Kahveci A, Mansour N, & Alarfaj M. (2016). Construct validity and reliability measures of scores from the Science Teachers' Pedagogical Discontentment (STPD) scale. *Eurasia Journal of Mathematics, Science & Technology Education, 12*(3), 549-558.

Conference Papers

1. Kahveci M, Kahveci A, Mansour N, & Alarfaj MM. (2015). *Construct validity and reliability measures of scores from the Science Teachers' Pedagogical Discontentment (STPD) Scale*. Paper presented at the National Association for Research in Science Teaching International Conference (NARST). Chicago, IL, USA. April 11 - 14, 2015.