# Handbook of Research on Fostering Student Engagement With Instructional Technology in Higher Education

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A volume in the Advances in Educational Technologies and Instructional Design (AETID) Book Series

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# Detailed Table of Contents



This chapter presents a framework for utilizing a sociocultural theory (SCT) approach to design and implement social media-based learning activities intended to foster learner engagement in higher education coursework. The author discusses the current status of social media, especially as used for educational purposes, as well as the documented learning benefits and challenges. This is followed by an overview of SCT, including its key concepts such as mediation, the zone of proximal development, and scaffolding. Building on these key concepts four pedagogical suggestions are described for fostering learner engagement via social media: provide the foundation for a community of practice, design meaningful and authentic learning activities, guide learners' engagement, and assess learning as a dynamic social process. The chapter concludes with a discussion of suggestions for future research.



In this chapter, four instructors share their perspectives transforming three existing face-to-face courses into hybrid models at a public, urban university in an effort to improve learner engagement with course content and provide flexibility for student to meet out of school life demands. The authors will provide insight into their decisions to transition to this model, experiences developing and implementing the model for the first time, and the outcomes and impact the approach has had in their work with university students.



This chapter studies the challenge and issue of developing a sound social networking technology (SNT) framework to affect positive student engagement and consequently effective learning. The author aims

Reflection is an essential component of experiential learning. Traditional means of reflection rely on memory of experiences, which can be incomplete or even faulty. Video-enhanced performance feedback (VPF)—the use of video to as supporting evidence in the reflective process—has the potential to transform reflective practice. In this chapter, the authors describe how VPF has been utilized by 13 instructors across two higher education institutions for the purposes of noticing, self-reflection, and evaluation/ feedback. Results of an exploratory case study on perceptions of using VPF to support reflection indicate approximately 90% of students found Vosaic, the technology used at these institutions for VPF, easy to use and helpful to notice strengths and areas for improvement in their professional practice. Implications and considerations for incorporating VPF across disciplines are also addressed.



In efforts to improve students' digital literacies on a STEM-focused campus, one university created a digital literacies initiative to support both faculty and students. Faculty development programming supported the development of assignment parameters, detailed assessment rubrics, and scaffolding activities. A campus tutoring center was piloted to support students' acquisition of digital literacies. This chapter offers examples from three faculty members who participated in the digital literacies initiative and implemented digital literacy assignments in their courses. The researchers offer best practices for campuses interested in developing digital literacy initiatives.



Humanities are pertinent to the digital culture of today. This chapter details how non-Humanities students are engaged in "Digital Humanities: From Text to txt," a team taught, multidisciplinary course offered at the University of Auckland since 2016. Engagement across five Humanities disciplines—Art History, English Literature, History, Philosophy, and Religious Studies—is unified with the common theme of the "digital turn." The course is modular with each discipline given a two-week block in a twelve-week semester. Students learn with and about technologies through a range of digital forms of engagement encountered in the Humanities. The course builds on students' digital curiosity to revisit questions of personal identity, ethics and belief, meaning, creativity, and historical understanding. Engagement begins in the lecture and tutorial and is deepened via five short assessments and an online final examination. Over the two iterations of the course, student satisfaction and pass rate was high and enrolments increased by 20%.


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*Özge Misirli, Eskisehir Osmangazi University, Turkey*

In this chapter, a game-based student response system, Kahoot!, is investigated. The purpose of the chapter was to analyze instructors and pre-service teachers' perspectives about the use of this platform. The advantages and disadvantages of integrating this tool in the classroom was investigated. Pre-service teachers' feedback and instructors' experiences using Kahoot! in higher education classrooms indicate that pre-service teachers welcome the use of these kind of games. Kahoot! can be used not only to increase student participation in the classroom but also as a formative assessment tool. Kahoot! can provide an engaging learning environment and adds active participation in the classroom by appealing even the most introverted students. In addition, immediate feedback feature of this game-based learning platform provides opportunities for instructors to tailor their instruction based on student understanding on games.


*Judith A. Giering, University of Virginia, USA*
*Yitna B. Firdyiwek, University of Virginia, USA*

This chapter describes the experiences of a liberal arts college that is part of a large research university implementing e-portfolios with a focus on learning engagement. Using qualitative data collected over time and programmatic experience, the team assesses the depth of engagement their students are experiencing, to determine whether most students are using e-portfolios to engage in learning on their own, or only when prompted to do so by faculty within the confines of a single course. Too few students have taken full ownership of their e-portfolios and engaged with them as a meta-high impact practice. Implications of this finding suggest faculty using e-portfolios need to be intentional about student engagement at the meta-high impact level. Part of achieving this is developing further clarity on what it looks like when e-portfolios are designed to be used as a meta-high impact practice while applying more rigorous methods to determine when students have reached this level of engagement.


*Madeline Craig, Molloy College, USA*

This chapter explores the use of Flipgrid for student engagement in a gradual three-level process of technology integration. The three levels of integration, or "immersion," are acclimation, movement, and submersion, and this is demonstrated by comparing Flipgrid integration to a day at the beach. Flipgrid is a comprehensive tool that provides opportunities for educators to integrate it into their face-to-face, hybrid, and online courses to a limited extent or to fully use all of the features available to them at no cost. The background of Flipgrid, as well as the benefits of using video as an educational tool, was thoroughly researched to provide evidence to support the use of Flipgrid for student engagement and assessment. The chapter concludes by including the limitations of Flipgrid and future research directions.

In this chapter, Harasim's online collaborative learning theory (OCL) will be addressed as it explains how collaborative learning takes place in online environments via the use of online collaborative tools. Preliminary studies on using FlipGrid and VoiceThread, discussion tools which incorporate dynamic media such as audio and video, will be explained in the context of how such collaborative media tools can foster student engagement and collaboration. Implications of using these online tools and how they contribute to collaborative learning practices will be discussed in the context of OCL theory.



This chapter is based on a review of the literature, initial lab examinations, and experiences teaching university undergraduate pre-service teachers and master degree students in Instructional Design and Technology. The authors analyzed the literature, benefits, drawbacks, experiences, and educational implications of integrating augmented reality in higher education to prepare students for eventual workplace success. Using augmented reality, three-dimensional interactive digital imaging provides an immersive, engaging learning environment to interact with content in new ways not previously possible. The 3D models can impart significant content information by viewing digital objects from any angle, sometimes peeling back the layers, all in real time. In addition, they consider the educational implications for integrating and evaluating augmented reality.



This chapter explores student engagement during telecollaboration processes as well as fundamental aspects to foster its development. In order to tackle this aim, a theoretical discussion about student engagement in technology-mediated learning processes, and particularly, telecollaboration environments is presented together with a practical case study exploring this construct. Three different types of student´s engagement (emotional, cognitive, and behavioral) are considered in a telecollaboration project between a Spanish and a North American university in which 32 students participated over four months. In addition, with regard to the analysis of students' engagement in telecollaboration projects aiming for language development, different approaches and theories are presented in order to shed light on the analysis of this construct during online virtual exchanges. Aspects such as student use of technology, engagement scales, and surveys and an analysis of the interaction are considered. Finally, further research lines regarding telecollaboration and engagement are suggested.

A game-based learning team exercise was specifically designed as a teaching tool which aimed to unlock the black box of cultivating student engagement in an online learning environment. In the exercise, online distance learning students were divided into police and prisoner groups whereby they were required to use different resources for catching the prisoners or for escaping from the police on a virtual map. The team exercise helped to create an innovative online learning environment that was active, cooperative, and encouraged student engagement, these being some of the key elements to enhance the quality of student experience. To evaluate the effectiveness of this exercise, an experiment was conducted using survey data from undergraduate students in an online learning environment. Results showed that the online class with a team-based activity had significantly higher scores in students' behavioral engagement than the other online class without a team-based activity while the differences in cognitive and emotional engagements were not significant.



This chapter presents a study that examined student perceptions of taking a digital literacy class online and its effects on the development of leadership skills in relation to the use of technology. It was found that, in general, the participants tended to be satisfied with this online class. Their perceptions of different types of interactions were discussed. The participants tended to perceive that this class was effective in developing their knowledge and skills in using technology to enact leadership practice. The results have implications in online teaching and learning, group projects and technology learning in leadership development.



Good teaching practices are the crux of student education and require constant evaluation to meet current generations' learning needs. Flipped classrooms have sought a foothold in higher education to provide opportunities for deep learning through the delivery of content online prior to attending class while having activities related to processing and applying the information during class. Using a large-scale, multi-institution study of faculty teaching flipped courses, this study empirically links flipped procedures to other forms of effective educational practice and additionally focuses on the motivations and impacts on the faculty side of this pedagogical practice. Findings indicate numerous learning and development benefits for students with implications for supporting and motivating faculty across disciplines, faculty identities, and course types.

This chapter describes an instructional method designed to integrate technologies fostering student engagement in a course content where educators reverse the roles traditionally held by teachers and learners. To provide context for this method, it details an example course designed for the pre-service teacher to develop technology integration in their future K-12 classes. This example provides a model of the theoretical rationale that supports practical applications of technology and the reversing constructivist role of the instructors enhancing learner engagement in technology-rich learning environments. In doing so, it introduces technologies fostering learner-centered technology engagement through introducing a "modified flipped spiraling curriculum" model. Furthermore, it demonstrates the performance indicators to evaluate the course and students' achievement of objectives. Finally, it tries to depict this model for instructors, instructional designers, pre-service teachers, and educational technologists to use it as a guide to design and implement similar courses.



Students are diverse. They vary widely in their background knowledge, interests, languages, academic strengths, and learning needs. In order to retain these students, higher education institutions must create flexible and engaging learning environments. Universal design for learning (UDL) is a research-based framework used to guide the development of instructional goals, teaching methods, materials, and assessments to meet the needs of all learners. The three overarching UDL principles and corresponding guidelines are discussed as a framework for making decisions about integrating digital tools into teaching and learning environments. Examples of how the authors have used technology to meet the guidelines in higher education classrooms are provided.



This study investigated pre-service language teachers' experiences and capabilities in DST as well as their views on the use of DST in language teaching. A case study design was adopted in the current study. Eighty-three pre-service teachers participated in the study, and they created 25 digital stories. Data of this study came from the evaluation of digital stories and open-ended questionnaire. Pre-service teachers' digital stories were analyzed using rubrics and subjected to descriptive statistics. Data from an open-ended questionnaire on pre-service teachers' perceptions regarding the DST in language teaching

# Preface

Student engagement is defined as student involvement in meaningful educational activities (Kuh, 2003). It is considered an indicator of learning and educational development (Axelson & Flick, 2011). Student engagement can also refer to students' willingness to participate in the learning process that will help promote their learning, understanding, and application of knowledge. Technology provides many opportunities to enhance student engagement. More research is needed to show how technology can be used effectively to enhance student engagement. This book aims to provide practical and research-based knowledge and skills to engage students with technology across the disciplines in higher education.

## ORGANIZATION OF THE BOOK

This book is organized into 25 chapters. A brief description of each of the chapters follows:

Chapter 1 presents a framework for utilizing a sociocultural theory (SCT) approach to design and implement social media-based learning activities intended to foster learner engagement in higher education coursework. Building on key SCT concepts, four pedagogical suggestions are described: provide the foundation for a community of practice, design meaningful and authentic learning activities, guide learners' engagement, and assess learning as a dynamic social process.

In Chapter 2, four research practitioners share their rationale, processes and experiences transforming existing face-to-face courses at a public university into a hybrid/flipped model. In addition to increasing student engagement, the instructors found this course redesign put students more in control of their learning and expanded opportunities for critical thinking. The chapter includes insights, reflections, and recommendations for future practice.

Chapter 3 describes and discusses the development of a 'Social Networking Technology' (SNT) model for contemporary higher education to effect lifelong learning, and positive student engagement level. The author meshes two disparate theories of technology acceptance and ARCS with a qualitative case study at a north-eastern large public university on usage of Twitter in graduate education to frame a SNT model.

Chapter 4 explores how one graduate-level seminar incorporated technology and insights from the science of learning to improve the delivery and assessment of course content in a higher education leadership program at The University of Texas at Austin. The authors include practical recommendations for instructors who seek to incorporate insights from the science of learning in their graduate courses.

Chapter 5 focuses on understanding individual cognitive differences in order to improve student engagement. The rest of this chapter is organized as follows: Firstly, student engagement is defined based on different engagement models with a special focus on video lectures. Secondly, previous research will be reviewed to discuss the relationship among student engagement, video lectures and cognitive individual differences. This is followed by recommendations that can be used for further student engagement research.

In Chapter 6, the authors describe how video can be used to support experiential learning by providing evidence for reflection and feedback. In their special education teacher preparation programs, the authors use a video annotation tool called Vosaic to help teacher candidates improve their performance on skill-based learning outcomes. Recommendations for tool selection and implementation across disciplines are discussed.

Chapter 7 offers examples of authentic digital literacy assignments from three faculty members who participated in a Digital Literacies Initiative, with faculty development and tutoring center support. The researchers offer best practices for developing digital literacies on other campuses.

Chapter 8 details how undergraduate students at the University of Auckland, New Zealand are engaged using technology-mediated authentic assessments in a "Digital Humanities" course. This multidisciplinary course on the common theme of the "digital turn" builds on students' digital curiosity to revisit questions of personal identity, ethics and belief, meaning, creativity, and historical understanding. The engagement strategies and pedagogical reasoning detailed here can be used across multiple disciplines and levels of higher education to provide authentic and experiential learning opportunities.

Chapter 9 investigates the use of a game-based student response system, Kahoot! in higher education classrooms. Instructors and pre-service teachers' perspectives about the use of this platform and the advantages and disadvantages of integrating this tool in the classroom were investigated. Implications and recommendations for implementing the game-based student response system (GSRS) in classrooms are discussed.

Chapter 10 describes the experiences of a liberal arts college that is part of a large research university implementing ePortfolios with a focus on learning engagement. Findings suggest that faculty using ePortfolios need to be intentional about student engagement at the meta-high impact level. Part of achieving this is developing further clarity on what it looks like when ePortfolios are designed to be used as a meta-high impact practice while applying more rigorous methods to determine when students have reached this level of engagement.

Chapter 11 explores the use of Flipgrid for student engagement in a gradual three level process of technology integration. The benefits of using video as an educational tool in face-to-face, hybrid and online courses was researched. The chapter wraps up by including the limitations of Flipgrid and further research directions.

In chapter 12, Harasim's online collaborative learning Theory (OCL) will be explained in the context of the adaptation of Flipgrid and Voicethread in educational and collaborative activities. A discussion around the use of Flipgrid and VoiceThread (discussion tools which incorporate dynamic media such as audio and video) in recent literature for instructional purposes in online and offline settings will reveal how the existing practices relate to OCL.

Chapter 13 includes an analysis of augmented reality based on a literature review of the benefits, challenges, research explorations, and educational implications resulting from integrating augmented reality into higher education. By overlaying three-dimensional interactive models on the real-world environment one provides deeper insights for fostering learning and higher-level engagement.

Chapter 14 explores students' engagement during telecollaboration processes as well as fundamental aspects to foster its development. In order to tackle this aim, a theoretical discussion about students' engagement in technology-mediated learning processes, and particularly, telecollaboration environments is presented together with a practical case study exploring this construct.

Chapter 15 presents two teaching and learning frameworks that cultivate student engagement, embedded in a unique online learning model based on technology and data-driven decision-making. The first framework, adaptive learning, facilitates learning tailored to individual students. The second framework, Universal Design for Learning, ensures students have equitable opportunity to access, process and represent their learning.

Chapter 16 builds on Vygotsky's social constructivism theory to recognize how online collaboration might be helpful for preservice teachers' development and collaborative learning. There are various tools used to facilitate online collaborative activities for learning in teacher education programs and this chapter provides a comprehensive literature review to demonstrate the applications of virtual collaboration occurring in pre-service education programs and the types of online collaboration used for teacher education.

Chapter 17 addresses specific strategies for utilization of course design, pedagogies, and instructional technologies to incorporate student interaction and develop and maintain students' motivation in their learning.

Chapter 18 describes a game-based learning team exercise specifically designed to unlock the black box of cultivating student engagement in an online learning environment. This team exercise helps to create an innovative online learning environment that is active and cooperative, these being some of the key elements to enhance the quality of student experience.

Chapter 19 presents a study that examined students' perceptions of taking a digital literacy class online in a leadership program. Their satisfaction with learning online and perceptions of the effects of this class on the development of their leadership skills are reported. Implications and recommendations for online learning and preparing leadership students to use technology are discussed.

Chapter 20 discusses a multi-institution study of faculty teaching flipped courses, linking flipped procedures to other forms of effective educational practice and additionally focuses on the motivations of this pedagogical practice. Findings indicate numerous learning benefits for students and implications for supporting faculty across disciplines, faculty identities, and course types to develop flipped courses.

Chapter 21 introduces a new model of flipped classroom called Modified flipped spiraling Curriculum in a technology-enhanced teacher education classroom. This chapter provides a model of the theoretical rationale that supports practical applications of technology and the reversing constructivist role of the instructors that can enhance learners' engagement in technology-rich learning environments. This chapter contains many hands-on activities, assessments, rubrics, and technological tools for educators to enhance technology engagement of students in a spiraling curriculum model.

Chapter 22 describes how Universal Design for Learning (UDL), a research-based framework for developing instructional goals, teaching methods, materials, and assessments, can be used to engage all learners. UDL principles and guidelines are discussed as a framework for making decisions about integrating digital tools into undergraduate and graduate coursework. The authors provide examples of how they have used technology to meet the guidelines.

Chapter 23 investigates pre-service language teachers' experiences and capabilities in DST about creating digital stories as well as their views on the use of DST in language teaching. The results revealed that despite being novice DST-developers, pre-service teachers were capable of creating digital stories.

They reported that DST had the potential to enhance students' learning outcomes. In addition, they were eager to adopt DST in their future teaching. However, they complained that DST required too much time and effort, and sophisticated information and communication technology skills.

Chapter 24 contends that individuals' online interactions account for a great deal of informal learning and that by integrating these digital tools in our classrooms, instructors can complement and extend the formal learning of their courses. Specifically, this chapter offers three ways that technology can assist with instructors' goals: by promoting inclusive participation, enhancing the classroom climate, and enabling students to explore and demonstrate course material in an engaging manner. To these ends, the authors explore the efficacy of social media sites, Google applications, and GIFs and memes.

Chapter 25: the increase in the use of digital technologies for learning purposes in different teaching and learning environments brought up reviewing and recognizing the change of roles in higher education; which in this chapter leads to the need of investigating the perceptions of technology usage from both students' and faculty perspectives. As a result of these changing roles; the pedagogical methods and technological tools used in digital teaching and learning process should be considered, as not a sole decision of the institution, but as a result of a collaborative mindset of institution, faculty and students.

## OBJECTIVE OF THE BOOK AND TARGET AUDIENCE

This book aimed to address how student engagement can be fostered with the integration of technology within the context of higher education. In particular, this book provides practical and research-based knowledge and skills on how instructional technology can help to improve student engagement.

This book is intended for instructors in higher education, instructional designers/technologists, educational developers, and researchers. Additionally, those who are involved in improving student engagement at the higher education level will benefit from this book.

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# Chapter 1
# Social Media in Higher Education:
## Fostering Learner Engagement Through a Sociocultural Approach

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## ABSTRACT

*This chapter presents a framework for utilizing a sociocultural theory (SCT) approach to design and implement social media-based learning activities intended to foster learner engagement in higher education coursework. The author discusses the current status of social media, especially as used for educational purposes, as well as the documented learning benefits and challenges. This is followed by an overview of SCT, including its key concepts such as mediation, the zone of proximal development, and scaffolding. Building on these key concepts four pedagogical suggestions are described for fostering learner engagement via social media: provide the foundation for a community of practice, design meaningful and authentic learning activities, guide learners' engagement, and assess learning as a dynamic social process. The chapter concludes with a discussion of suggestions for future research.*

## INTRODUCTION

Because of the widespread availability of the Internet, mobile devices, and social media tools, we now live in a world that is more interconnected than ever before. In fact, more than three billion people worldwide are actively using various social media tools (Kemp, 2017) to connect with friends, family, colleagues, and countless others from personal, professional, and academic networks. Traditionally, Facebook and YouTube have dominated social media statistics in the U.S.; however, in recent years younger adults and teens have gravitated toward Instagram, Snapchat, and Twitter. Furthermore, 88% of all adults 18 – 29 years old in the U.S. report using social media on a regular basis (Pew Research Center, 2018) to engage with others via text, audio, video, images, and combinations thereof. It is this high level of user

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engagement that distinguishes the more popular tools from others and provides unique opportunities to stay in touch, get up-to-date news, fill spare time, and share information.

Although the ubiquitous nature and significance of social media in our personal lives are easy to pinpoint, the potentialities for such tools to enhance student learning and foster engagement in educational settings are still emerging. Over the past two decades, educators have adopted various social media tools to design and implement learning activities. For example, Chugh and Ruhi (2018) report on 25 peer-reviewed studies that leveraged Facebook for educational purposes. Other publications highlight uses of Twitter (Bista, 2015; Evans, 2014; Kassens-Noor, 2012) and YouTube (Fleck, Beckman, Sterns, & Hussey, 2014; Orús, Barlés, Belanche, Casaló, Fraj, & Gurrea, 2016; Ricoy & Feliz, 2016; Terantino, 2011) in higher education. Thus far, several benefits of employing social media in education have been identified, including but not limited to increased learner collaboration and reflection (Cochrane & Bateman, 2010; Gao, Luo, & Zhang, 2012), increased connectedness with classmates and the instructor (Bowers & Kumar, 2015; Thai, Sheeran, & Cummings, 2019), and increased participation (Evans, 2014; Imlawi, Gregg, & Karimi, 2015). In addition, research in writing studies has identified the potential to reach a broader public audience as a notable advantage for increasing learner engagement (Walls & Vie, 2017). Each of these reports point to overall increased learner engagement of various forms; yet, utilizing social media in higher education also presents notable challenges. In particular, Manca and Ranieri (2017) describe the pedagogical challenges encountered when implementing social media-based activities, including the imperative for applying a relevant learning theory to the design and assessment of such activities.

To address this imperative and ensure maximizing learner engagement through social media tools, we must better situate this type of activity within an appropriate learning theory that enables educators to integrate uses of instructional technology with their pedagogical beliefs. Therefore, this chapter provides an overview for a sociocultural approach to designing meaningful and authentic learning activities to foster learner engagement in university-level courses through the use of social media tools. Vygotsky's sociocultural theory (SCT) is an appropriate choice for the instructional design of social media-based activities, because it conceptualizes learning as a social process and highlights the impact that social factors and mediational tools have on learners' development of higher order thinking skills (1978). The overview provided here includes a framework for designing activities, based on key SCT concepts such as development through social interactions, the role of mediational tools, the zone of proximal development (ZPD), and scaffolding. The chapter concludes with a discussion of suggestions for future research.

## WHAT IS LEARNER ENGAGEMENT?

In general terms, learner engagement can be defined as the "time, energy, and resources students devote to activities designed to enhance learning at university" (Krause, 2005, p. 3). More specifically, learner engagement may be best understood as a relationship between the student and the learning environment. In addition to many social and emotional benefits, trends in research from higher education have shown that students who are more actively engaged in the learning process experience higher levels of achievement (Chen, Lambert, & Guidry, 2010; Wang, 2017). As a result, many educators have attempted to increase learner engagement by employing group activities (Barber, King, & Buchanan, 2015; Chen & Chiu, 2016), game-based learning (Abdul Jabbar & Felicia, 2015; Hamari, Shernoff, Rowe, Coller, Asbell-Clarke, & Edwards, 2016), and various other strategies.

In more recent years, computer and web-based technologies have been utilized as a means to foster learner engagement in the online environment. University faculty and researchers have experimented with flipped instruction (Lee, Park, & Davis, 2018), use of apps (Li, Lee, Wong, Yau, & Wong, 2018; Pham, Nguyen, Hwang, & Chen, 2016), and social media to increase learner engagement (Lau, 2017). When considering online environments in higher education, Redmond, Abawi, Brown, Henderson, and Heffernan (2018) classify learner engagement into five dimensions: behavioral, cognitive, collaborative, emotional, and social. These five elements serve to account for students' unique actions, feelings, thought processes, and social interactions when engaging in an online learning activity. Furthermore, they highlight the need for effective instructional design to target elements of learning to better encourage learner engagement in online environments. As Costley, Hughes, and Lange (2017) note, instructional design in online environments plays a pivotal role in encouraging learner engagement.

The argument for increased attention to instructional design for online learning activities is an essential component to the recommendations being made in this chapter. Similarly, the five dimensions (behavioral, emotional, cognitive, social, and collaborative) of learner engagement will also be carried through the remainder of the chapter as specific recommendations are discussed for fostering learner engagement in social media through a SCT approach.

## SOCIAL MEDIA AND HIGHER EDUCATION

Social media are "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content" (Kaplan & Haenlein, 2010, p. 61). Whereas, in broad terms, social media tools are defined by the capacity to broadcast information to the masses, social networking applications include a mechanism for users to communicate with each other through continuous dialogue. It is this communicative function provided by social networks, hereinafter referred to as social media, that will be the primary focus for the remainder of the chapter. Popular social networking tools in the U.S. include Facebook, Twitter, YouTube, Instagram, and Snapchat, and each of these applications has specific functions built into their design. For instance, "Facebook is designed to allow users to readily connect with others and to share content, while Twitter is designed to allow users to broadcast short messages and to follow conversations, topics, and people of interest" (Junco, 2014). Drawing on these defining characteristics, in our personal lives we use social media to connect and communicate with family and friends, share posts and photos, and discuss via comments and approval ratings. Professionally and academically, we use such applications primarily to create, share, and discuss a wide variety of digital contents.

Since the inception of Six Degrees in 1997 (Hendricks, 2013), a predecessor of Facebook that enabled users to create a personal profile and connect with other users, social media applications have steadily revolutionized how we utilize the Internet. Prior to Web 2.0 and social media, a limited number of Internet users perused "a one-way broadcast delivery system where the individual user downloads data, information and other resources provided by a relatively small number of content providers" (Selwyn, 2012, p. 1). Now, roughly 70 percent of the U.S. population (Pew Research Center, 2018) and more than three billion users worldwide (Kemp, 2017) actively create and post their own content via social media, which is then shared with others to be viewed, discussed, and even modified. Many have described this form of active engagement via social media as collaborative, dynamic, social, and interactive (Brown, 2012; Oeldorf-Hirsch, 2018; Selwyn, 2012). Each of these concepts serve to highlight the increased and constantly evolving user engagement commonly found with social media applications, which is the focus of this chapter.

As social media usage has increased over the past two decades, the availability and variety of social media tools have also expanded. Current tools can be classified into six categories according to their functions: social networks, bookmarking sites, social news, media sharing, microblogging, and blogging (SeoPressor Connect, n.d.). Many educators have leveraged these social media tools to increase the social and collaborative nature of their teaching and students' learning in higher education programs, such as business (Piotrowski, 2015), education (Krutka, Nowell, & Whitlock, 2017), health and medicine (Guraya, 2016), humanities (Hu, Gu, Liu, & Huang, 2017), sciences (Whittaker, Howarth, & Lymn, 2014), and others. For example, Krutka et al. (2017) document the use of various social media by teacher educators as a means to develop social media teaching skills in preservice teachers, and Guraya (2016) reports on social media usage by medical students for educational purposes. Thus far, social media tools have been used primarily to enable students to engage with external experts and resources (Chen & Bryer, 2012) and foster online discussions of designated topics (Chen & Bryer, 2012; Moran, Seaman, & Tinti-Kane, 2011). In the following sections of this chapter, the benefits and challenges of utilizing social media in higher education will be discussed in more detail.

## Educational Benefits Associated with Social Media

To date, the benefits of implementing social media-based learning activities in higher education are widely associated with positive social and cognitive outcomes. Because participation in this environment is based on posting, reading others' posts, and commenting, such learning activities have been linked with creating improved lines of communication between students and other students and between students and instructors (Heafner & Friedman, 2008; Hrastinski, 2009; Jackson, 2011; Tomai, Rosa, Mebane, D'Acunti, Benedetti, & Francescato, 2010). As a result, the learning environment evolves to become more collaborative, communicative, and social in nature, which students and instructors associate with building a stronger sense of community (Arnold & Paulus, 2010; Bowers & Kumar, 2015; Top, 2012). Drawing from the field of writing studies, the potential to reach a broader public audience, and perhaps participate in a larger community, has been identified as a relative advantage of writing social media (Walls & Vie, 2017). The capacity to personalize social media pages further contributes to students' perceived sense of community within these learning activities (Top, 2012; Yaros, 2012) and affords students the opportunity to forge their own online identities (Rodríguez-Gómez & Ibarra-Sáiz, 2014).

Perhaps more importantly, as students experience a stronger sense of community and better connections with their peers and instructors via social media learning, they also become more actively engaged with the content material (Chen et al., 2010; Junco, 2012a; Junco, Heiberger, & Loken, 2011). The byproduct of this increased engagement is increased overall learning (Al-Rahmi, Othman, & Yusuf, 2015; Fewkes & McCabe, 2012; Heafner & Friedman, 2008; Jackson, 2011; Laird & Kuh, 2005; Yu, Tian, Vogel, & Kwok, 2010), which is the ultimate goal of any learning activity. For example, Al-Rahmi et al. (2015) demonstrate how the use of social media positively impact academic performance in the Malaysian higher education context. Furthermore, other researchers describe how social and academic engagement with social media tools leads to a deeper understanding of course material (Chen & Bryer, 2012; Fewkes & McCabe, 2012), which includes more than simply memorizing discrete pieces of information. Others refer to this form of deeper understanding in terms of improvements in critical thinking skills (Balakrishnan & Gan, 2016; Pike, Kuh, & McCormick, 2011; Thaiposri & Wannapiroon, 2015) and reflective thinking skills (Gao et al., 2012; Hew & Cheung, 2013).

In summary, a multitude of studies have demonstrated educational benefits commonly associated with the use of social media in higher education. Most notably, many of these findings support the fostering of increased learner engagement through collaboration, interaction, and personalization and negotiation of content material.

## Educational Challenges Associated with Social Media

Although many have documented the potential for social media to benefit learning in higher education, several challenges have also been noted that should be considered when deciding to adopt social media as an instructional tool. One cause for concern is that using social media in higher education may negatively impact students' academic success. Thus, by serving as a distraction or providing too much stimuli for students to handle appropriately or stay on task, their GPAs may be affected negatively (Junco, 2012b; Junco & Cotten, 2012; Kirschner & Karpinski, 2010; Lau, 2017). Therefore, the use of social media may serve to distract students from learning, studying, or preparing for class (Andersson, Hatakka, Grönlund, & Wiklund, 2014). For example, Lin, Hou, Wang, and Chang (2013) report that while participating in social media-based activities, students often engage in online discussions that are considered off-topic, and these discussions distract from meaningful learning.

Another challenge regarding social media for pedagogical purposes is privacy. Student concerns for privacy are diverse and often depend on the nature of the social media and its particular use (Bergström, 2015). Some students may be resistant to using social media at all; others might be concerned about mixing their education with their personal lives online. Thus, it is not a foregone conclusion that students are willing to use this social media outside of their personal, social circles. Likewise, Moran et al. (2012) report that faculty feel privacy is a "very important" barrier to consider when contemplating the use of social media for teaching. Faculty may feel "unwelcome in their students' social networks and communities" (McLoughlin & Lee, 2010, p. 38) or want to avoid revealing too much about themselves. For example, Manca and Ranieri (2016) describe how faculty are more comfortable sharing and connecting with peers via social media for professional purposes rather than integrating these applications into their teaching practices, which may require sharing more personal information with students.

Perhaps the most concerning challenge associated with social media in higher education is that some educators are not utilizing the tools in ways that match the learning benefits previously reported by other researchers (Rogers-Estable, 2014). This may be due to the distinction between how students and instructors engage with social media for personal and academic use (Arnold & Paulus, 2010; Roblyer, McDaniel, Webb, Herman, & Witty, 2010). Often, students and instructors know how to use social media in their personal lives, but they prefer not to apply social media for academic use (Terantino, 2013). In addition, Crook (2012) describes the need to examine and redefine the roles of students and instructors, because our understanding and expectations for participation, collaboration, learning, and assessment in social media environments need to be reimagined to account for their unique characteristics. Therefore, it is imperative that faculty in higher education adopt explicit pedagogical approaches when designing and implementing social media-based activities for teaching and learning purposes.

There is currently a lack of models that delineate theory-based strategies for devising and implementing learning activities via social media. The present chapter posits that SCT is a logical choice for framing learner engagement in social media-based learning activities, because it emphasizes the role of one's participation in social interactions and the influence of such activities on learning and cognitive development.

## OVERVIEW OF SOCIOCULTURAL THEORY

SCT explains how an individual's cognitive development is directly related to cultural, social, and historical contexts. Vygotsky, a Russian psychologist, proposed the original framework for SCT, which can be conceptualized within three overlapping themes: 1) learning as a social process with cultural or societal origins, 2) the role of mediational tools in cognitive development, and 3) the ZPD.

First, according to SCT, social interaction is essential to individual cognitive development. In Vygotsky's words, "development appears twice: first, on the social level, and later, on the individual level" (1978, p. 57). Learning, therefore, is embedded in social interactions, which play a pivotal role in the development of higher order thinking skills. This does not signify that learning is a direct transmission of knowledge or skills from one person another. Rather, it is a "transformation of participation in a sociocultural activity" (Matusov, 2015, p. 315) that evolves over time and depends greatly on the social actors involved. As a result, to better understand how one appropriates new information, we must also comprehend the social, cultural, and historical contexts surrounding the learner, because each individual will learn knowledge and skills based on this context and his or her own needs and experiences. Here, it is important to note that this SCT conceptualization of learning in social contexts is distinct from Piaget's theory of cognitive development (1936). Within SCT, "development occurs as children learn general concepts and principles that can be applied to new tasks and problems; whereas from a Piagetian perspective, learning is constrained by development" (Scott & Palinscar, 2013). Therefore, according to SCT, cognitive development is not limited to biological or maturational development.

Second, within the SCT framework, mediational tools serve to facilitate learners' construction of knowledge, both at the social and individual levels. Vygotsky asserted that language is the most essential mediational tool for development of higher order thinking; however, he also described other potential tools, such as "various systems of counting; mnemonic techniques; algebraic symbol systems; works of art; writing; schemes, diagrams, maps and mechanical drawings; all sorts of conventional signs and so on" (1981, p. 137), which may influence the individual's cognitive activity in a given sociocultural context. For example, as individuals work with a mediational tool, such as the computer, they learn how to utilize the tool in their sociocultural context. Over time, they internalize what has been learned and how to use the tool, but they also begin to adapt the tool for personal use. This adapted use of mediational tools, or appropriation, allows the individual to utilize the tool in the future for similar and emerging uses.

Third, through the use of these mediational tools, individuals acquire new mental functions when assistance is offered in the ZPD. Vygotsky used the term ZPD to distinguish between the actual and potential levels of development. More specifically, he defined the ZPD as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (1978, p. 86). Inherent to this definition of the ZPD is Vygotsky's assertion that development takes place through social interaction. Thus, the ZPD consists of the individual, the teacher or more capable peer, and the mediational tools available in the sociocultural context.

Throughout this process, the learner engages in a collaborative activity, often referred to as "guided participation" (Rogoff, 2008), with a more experienced person to acquire relevant knowledge and skills. Also essential to SCT and an understanding of this type of guided participation is the concept of scaffolding. Scaffolding consists of the tools or actions utilized by the more experienced person to guide the learner's understanding or development of new skills. Examples include but are not limited to providing hints, simplifying, modelling, questioning, explaining, and highlighting critical features of the task. The purpose of scaffolding is to enable the learner to complete a task or to solve a problem that would not have been possible without assistance from the expert or more experienced person. Such scaffolding should only be provided in as much as the learner needs assistance. Ultimately, scaffolding should be decreased and removed as the learner becomes more self-regulated.

In summary, SCT is a useful framework for informing educators' pedagogical decisions, and its key principles align well with designing and implementing learning activities via social media, as will be addressed in the remainder of this chapter.

## FOSTERING LEARNER ENGAGEMENT VIA SOCIAL MEDIA

As identified previously in this chapter, there are various potential learning benefits associated with the use of social media in higher education, including findings that directly relate to learner engagement such as increased learner collaboration (Cochrane & Bateman, 2010; Gao et al., 2012), increased sense of community (Arnold & Paulus, 2010; Bowers & Kumar, 2015; Top, 2012), and increased participation (Evans, 2014; Imlawi et al., 2015). However, the pedagogical decisions and instructional design processes behind these social media-based learning activities often lack solid grounding in theoretical foundations. Building on the three pillars of SCT (learning as a social process, the role of mediational tools, and the ZPD), its conceptual framework will now be applied to theorize social media as a space for fostering learner engagement in higher education and discuss the related pedagogical advantages afforded by social media environments. Four specific recommendations will be discussed:

1. Provide the foundation for a community of practice.
2. Design meaningful and authentic learning activities.
3. Guide learners' engagement.
4. Assess learning as a dynamic social process.

### Provide the Foundation for a Community of Practice

To encourage learner engagement across the five dimensions outlined by Redmond et al. (2018), it is essential that instructors provide the foundation for a community of practice in the virtual space provided by social media. As noted, social media tools have the potential to aid in bolstering a stronger sense of community in higher education coursework. Yet, we must extend this concept of community further to build intentional social and learning spaces that enable learners to engage emotionally, socially, and collaboratively for the purpose of acquiring new knowledge and skills. Drawing from a SCT perspective, Wegner asserts that "a community of practice can be viewed as a social learning system" (Wenger, 2010, p. 1) where all learners and the instructor are brought together for the learning process through domain, a shared identity or learning need, and practice, interactions for rehearsing new knowledge and skills. In addition, Wenger identifies three key characteristics of successful communities of practice:

- Mutual engagement: the members' joint participation or interaction in the community.
- Joint enterprise: the common purpose that brings people together or the unified goal that drives their actions.
- Shared repertoire: a shared set of resources, procedures, jargon, or history (1998, pp. 72-84).

It is important to note that communities of practice cannot be formed (Roberts, 2006) without the instructor playing a role in facilitating their development. Simply creating a learning activity housed in social media does not guarantee the formation of a community of practice for educational purposes. Therefore, we must enact the principles of mutual engagement, joint enterprise, and shared repertoire, which encourage the development of a community of practice, as we plan for social media-based activities. Table 1 delineates several practical strategies for supporting the formation of a community of practice via social media:

By providing a strong foundation for a community of practice embedded in the social media environment, students will have increased opportunities to interact, share ideas, and practice new skills. Thus, students have to be engaged on multiple levels as outlined in Table 1. Learner engagement in this context is characterized by social collaboration, constant negotiation between learners and others, and the use of social media tools to mediate mental activity in sociocultural contexts. For these purposes, social media spaces, such as those provided by Facebook, Twitter, YouTube, or Instagram, are better suited than traditional learning management systems, because they put dialogic interaction and learning at the fingertips of the students. Their tools and functions are more intentionally designed to be used for constant interaction and also include affordances for integrating various forms of media, not just text as is the case in many learning management systems (LMS). Similarly, the same tools can be leveraged more effectively for telling stories, whether it be forging a personal or group identity or delineating the history

*Table 1. Strategies for supporting a community of practice via social media*

| Strategy | Dimension(s) of learner engagement addressed |
|---|---|
| 1. Identify the shared problem or purpose that will be addressed in the activity. | Cognitive |
| 2. Create procedural norms for communication, but also allow the members to establish new procedures as they become familiar with the social media application. | Behavioral, Cognitive, Collaborative, Social |
| 3. Encourage students to forge new relationships and build on existing ones. | Collaborative, Emotional, Social |
| 1. Provide opportunities for mutual negotiation of knowledge and skills. | Behavioral, Collaborative, Cognitive, Social |
| 2. Provide opportunities for individuals and the group to forge their identities. | Behavioral, Emotional, Social |
| 3. Build on shared history or experiences to process new knowledge and skills. | Collaborative, Emotional, Social |
| 4. Encourage conflict or disagreement and allow for mutual negotiation. | Cognitive, Collaborative, Emotional, Social |
| 5. Create a shared set of stories, cases, or experiences that may be viewed and analyzed. | Behavioral, Cognitive, Collaborative, Emotional, Social |
| 6. Archive the work of the community so that it may be viewed and reflected on after completion of the activity. | Cognitive, Collaborative, Emotional, Social |

of a particular set of stories or experiences. Last, whereas LMS are often used for linear presentation or discussion of materials, social media offer the ability for more dynamic interactions that better present opportunities for negotiating new knowledge, conflicts, or real-world problems.

## Design Meaningful and Authentic Learning Activities

To further foster learner engagement, it is essential that educators design meaningful and authentic learning activities via social media that serve as the foundation for collaborative learning experiences. Project-based learning (PBL) is often associated with the SCT perspective of teaching and learning, because it encourages learners to engage in collaborative social interactions in which they address a real-world problem (Savery, 2015). Thus, learners are also encouraged to engage cognitively, think critically, and apply new knowledge and skills to negotiate meaning, build consensus around an issue, and formulate a solution to the focus problem. By implementing meaningful and authentic learning activities via social media, students are also able to connect more easily with public audiences that typically deal with the issues being examined.

For example, from the vantage point of several academic disciplines in higher education, students might negotiate multiple solutions for worldwide problems such as hunger, lack of clean water, or immigration. By initiating learning activities via social media, the instructors and students may engage more easily with authentic public audiences and discipline-specific experts from national or international organizations, such as Action Against Hunger, the National Association of Clean Water Agencies, or the National Immigration Law Center. Doing so not only makes the learning experience more meaningful, it also connects students with real world actors in the field. Without social media tools, instructors are limited to physically bringing in a guest speaker or utilizing videoconferencing tools, which often limit the scope and nature of the interactions to one-way presentations with minimal time for questions and answers. Social media spaces enhance these types of activities by providing a venue in which students are more capable of voicing their own opinions and questions and engaging more directly with others.

Alternatively, the problem could be localized to the institution and therefore require students to connect with multiple organizations or stakeholders from their local community. In addition, these real-world issues should draw on learners' personal and collective interests and experiences and include elements of role-playing that simulate problem solving and therefore make collaborative learning more emotionally engaging. Such personalized learning should also relate to students' future employment needs. For example, business students taking a marketing class might engage in a social media activity in which they play the role of a social media director for a local company of their choosing or they could simulate marketing a new product and conducting market research. Such learner engagement would also provide additional networking opportunities and career advantages for the students that are not otherwise available without an internship experience.

As a result of tackling real-world problems through PBL, learners engage more actively with the content material and are capable of reaching a deeper understanding. Moreover, housed in social media these social interactions provide learners with opportunities to engage collaboratively and socially. They are able to forge new relationships, discuss, disagree, and negotiate knowledge and skills with real-world actors in their respective fields.

## Guide Learners' Engagement

Beyond instructional design for the activity, the instructor's primary role in a collaborative task is to guide learners' engagement on all levels. Utilizing SCT's concepts of ZPD and scaffolding, instructors should facilitate the learning process, not simply transmit knowledge. This may be better understood in terms of guided participation, which provides a lens for understanding the interpersonal interactions within a learning activity. As Rogoff (2008) describes, guided participation is a process by which people communicate and coordinate efforts to participate in a given activity or solve a problem. This form of participation may be full engagement or simple observation, and guidance refers to the direction or assistance that one receives from another more experienced learner, an expert (instructor), or from the sociocultural context itself. In SCT terms, this form of direction or assistance is referred to as scaffolding.

Initially, instructors may want to scaffold by framing the task or problem to be solved in its social, cultural, and historical contexts. Social media platforms are valuable places for achieving this, because they allow instructors to display and archive the historicity of the task at-hand through multimedia. They also allow instructors to provide contextual background to a task or problem from multiple perspectives, because it is easier to include materials from a wide range of sources. This provides students with a starting point for building their mental overview of the activity and preparing themselves for cognitive engagement. Within PBL this form of scaffolding may entail providing background information and helping learners to make sense of the problem under investigation, which simultaneously encourages students to frame their own level and type of participation in the activity. For example, instructors may also scaffold learner engagement by explaining the specific tools and their functions, common practices, and other relevant skills in the particular social media environment.

Furthermore, scaffolding should be intentional and embedded in the social media environment via various techniques, including providing examples, modelling, or posing questions. Many social media environments are ideal for explicit scaffolds, because they offer various opportunities for linking directly to examples via text, audio, video, or a combination of multimedia. They also enable posing questions in a variety of formats and require students to engage directly with the material presented in a dialogic fashion with other participants drawing from their classes and public audiences. These forms of scaffolding serve to increase learner engagement on all levels by prompting specific student actions, such as crowdsourcing, which may not be possible in other online or face-to-face environments.

Most importantly, scaffolding should be steadily decreased throughout the learning activity and ultimately removed when learners become more self-regulated. In limited cases, the instructor may scaffold instances of communication breakdown or failure to comprehend the problem. Again, the end goal is to encourage learners to take on more responsibility as they work through the activity. Doing this type of work in social media makes the students' work more visible to others and more readily available for authentic feedback from the instructor and other members of the social media community.

## Assess Learning as a Dynamic Social Process

The emergent paradigm for assessment in higher education aligns well with a SCT perspective of learning, because it emphasizes "the social processes that underpin the development of intellectual abilities, the construction of knowledge and the formation of students' identities" (Rodríguez-Gómez & Ibarra-Sáiz, 2014, p. 1). Based on this perspective of social interaction, assessment should emphasize the dynamic process of learning and development as a means of evaluating individual cognitive development, not measure static pieces of knowledge or facts. Tying into the previous suggestions offered to foster learner engagement, assessment should be challenging, meaningful, and authentic. As an extension of PBL, assessment should be embedded in authentic, real-world tasks and problems with various challenges and options for solutions. In addition, assessment should relate to the process of formulating a solution or the solution itself (Rodríguez-Gómez & Ibarra-Sáiz, 2014) by capturing the dynamic discussions, problem solving, and negotiating that take place during the activity. Therefore, instructors should design their assessments in a way that captures the social processes needed to complete a task or solve a problem and not just the final product itself. Social media facilitates this type of assessment, because it makes the learning process more transparent. Because posts, comments, and responses are archived in the social media environment, instructors have more insight to how students arrive at a particular conclusion, and they can better evaluate skills, such as careful reading and inquiry into the subject, contributing to the community, engaging with others, providing quality examples, and making a decision, which are otherwise unobservable in a traditional assessment.

Most importantly, assessments may be guided by the instructor, but students should be actively engaged in the process and aim to take more control over their learning through dialogue, negotiation, and collaboration. Therefore, learners have the opportunity to engage behaviorally, cognitively, and socially. They should also have opportunities to personalize the knowledge or skills to their own contexts, especially through reflective thinking, which links directly to emotional and cognitive engagement. Reflection questions such as "what would you do?" or "how would you apply this?" may encourage personalization of the content. Vygotsky described how this type of engagement helps to align instruction with the ZPD. By providing instruction and guidance within the ZPD, learners are better supported to develop skills and strategies that in the future may be applied in other situations (1978). To achieve this, instructors should include opportunities for students to role play within their field of study. By experiencing the specific context first hand, students will gain more discipline-specific knowledge and skills that transfer into the real world.

Last, social media tools also facilitate instructors and peers to provide more immediate feedback. Instructors do not have to collect individual assignments and process them for feedback purposes. The learning process is more readily available, and instructors should include their feedback more immediately and more intentionally in the social media environment. This serves to reduce the feedback cycle and establish a more authentic learning environment, which also maintains the authentic context of the learning activity.

## FUTURE RESEARCH DIRECTIONS

With a SCT approach to fostering learner engagement in mind, future research should focus more intently on the sociocultural dynamic of social media-based learning in higher education. Too often, we aim to measure gains in formal learning; however, the social processes that take place in online, collaborative environments typically include various forms of informal learning. SCT provides a theoretical lens for better understanding this type of learning. Therefore, future research can examine informal learning as a result of social media in higher education, that which may not be tied directly to the content material intended, as well as the development of communication skills that enable individuals to interact effectively and harmoniously with others. Often, these communication skills are what distinguish highly effective professionals from others in their field.

As it relates to the concept of guided participation, described briefly in this chapter, experimentation with social media-based apprenticeships may reveal interesting findings. Can various social media environments serve to prepare students in higher education through a form of apprenticeship to engage in a meaningful work activity after graduation? For example, could social media aid in establishing online apprenticeships for business, education, medical, or other students? Similarly, more research should be conducted to determine which academic fields are better suited for social media environments. Perhaps certain fields would not align well with the affordances of social media tools. Last, longitudinal research should be conducted to determine whether students continue using social media tools after completion of related coursework or after graduation. Do students appropriate these tools for their own future use or does use of the tool remain bound to the academic context in which it was first utilized?

## CONCLUSION

This chapter has conceptualized the design and implementation of social media-based learning activities within a SCT framework. By applying a SCT approach to utilizing social media in higher education, educators and researchers may reveal new understandings of the learning that takes place in this environment, which is uniquely mediated by the functions of the specific tool. This SCT framework also serves to highlight the importance of social interactions in the learning process and provides the foundation to the four suggestions described with regard to fostering learner engagement via social media:

1) Provide the foundation for a community of practice.
2) Design meaningful and authentic learning activities.
3) Guide learners' engagement.
4) Assess learning as a dynamic social process.

The practical suggestions offered here should be utilized to inform instructional decisions related to the types and quality of interactions designed for learning experiences embedded in social media and encourage instructors to think more explicitly about the various forms of learner engagement in online environments, as posited by Redmond et al. (2018). Linking the use of social media with a relevant learning theory better demonstrates that the decision to utilize social media is not driven merely by a propensity for innovation but rather by justified pedagogical advantages as described here.

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## KEY TERMS AND DEFINITIONS

**Community of Practice:** A group of people that share a common interest in a defined field or problem. The group members share information and experiences so that each person may learn from the others.

**Guided Participation:** A process by which a more experienced person helps another person who is less experienced to become more familiar with particular practices.

**Learner Engagement:** The quality and quantity of a learner's participation in educational activities. Includes behavioral, cognitive, and emotional participation and connectedness.

**Mediation:** A principle component of SCT. Human actions in the world are enhanced, controlled, and organized by internal tools, such as language, and external tools including physical artifacts.

**Project-Based Learning:** An approach to teaching and learning that encourages students to actively engaged with and find solutions to real-world problems.

**Scaffolding:** A teaching method used by instructors and more advanced peers to assist learners in gaining new knowledge and skills.

**Sociocultural Theory:** A psychological theory that conceptualizes learning as a social process and emphasizes interaction between people and their social, cultural, and historical contexts.

**Zone of Proximal Development (ZPD):** The area of learning that occurs when an individual is helped by an instructor or more advanced peer.

# Chapter 2
# Engaging College Students Through Hybrid Learning:
## Perspectives From Four Instructors

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## ABSTRACT

*In this chapter, four instructors share their perspectives transforming three existing face-to-face courses into hybrid models at a public, urban university in an effort to improve learner engagement with course content and provide flexibility for student to meet out of school life demands. The authors will provide insight into their decisions to transition to this model, experiences developing and implementing the model for the first time, and the outcomes and impact the approach has had in their work with university students.*

## INTRODUCTION

To align teaching approaches with student needs, many colleges and universities are increasingly offering online learning options. According to Hurlbut (2018) and Allen and Seaman (2016), 28% of students in higher education participate in *at least* one online course in their respective fields of study and 14% of students are enrolled exclusively in online programs. Online courses help keep overhead costs down,

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attract a wider range of students, including working adults and students with disabilities, by reducing or eliminating personal and logistical barriers when required to attend exclusively face-to-face classes, and broaden the pool of highly qualified instructors, who might otherwise be unable to teach for the same reasons (Drago, 2004; Mason, 2009; Lao & Gonzalez, 2005).

While increasing numbers of college instructors seem to be embracing the format (Roehl, Reddy & Shannon, 2013), others question the potential impact on the quality of educational programs, citing limitations in depth of content and student engagement. Gilboy, Heinerichs, and Pazzaglia (2015) define student engagement as learners constructing or reconstructing knowledge through the use of active learning strategies, such as problem-based learning, simulation, and collaborative discussion. In the field of teacher education, face-to-face courses are often seen as necessary to immerse future teachers in contexts representative of what they will later lead themselves. Despite Shachar and Neumann's (2010) research, in which they found 20 studies showing preservice teachers taking online courses outperformed their counterparts in traditional formatted courses, many education faculty remain reluctant to change formats, particularly for methods courses. They argue modeling and in-person direct exposure to strategies are essential to engaging students in the content and approaches to be used in their future classrooms.

To explore the possibilities for online in teacher education, the authors of this chapter — four instructors of methods courses at a northeast, urban, public university — engaged in a practitioner researcher project using their own courses. Campbell and McNamara (2009) define practitioner research as research done by practitioners themselves, typical for evaluation and improvement. To this end, for two academic semesters, the four practitioner researchers documented and reflected on their experiences as they developed and piloted a course structure that maximizes the benefits of online learning, and, at the same time, address the challenges they, like many college instructors, have experienced in engaging our students deeply with the content of the courses. Their model draws from the "flipped" classroom and the hybrid teaching model, which Babb, Stewart, and Johnson (2010) have identified as the fastest-growing format. Hybrid models employ online lectures and learning tasks using "easy-to-use, readily accessible technology" which complement in-person activities (Roehl, et al., 2013, p. 44). In flipped classrooms, the introduction to new content happens outside of the classroom, which frees class time from lectures and allows for more active, hands-on learning in its place.

The following sections describe what led to the decision to make these changes to their courses. The practitioner researchers will detail the design structure created, as well as reflect upon their own individual, ideological processes, and direct experiences with students. To test this model, the practitioner researchers applied the designed structure to their own courses during the 2018-2019 academic year. After sharing what the practitioner researchers learned as well as students' perspectives on their levels of engagement, the authors will offer suggestions and implications for theirs and others' future practice.

## BACKGROUND

This project began near the end of the Spring 2018 semester. Over the prior semester, three of the practitioner researchers, Tamara, Ann and Tal, met regularly to discuss and maintain coherence and consistency across two courses that Ann and Tal taught, and Tamara supervised. The two courses aimed to prepare future teachers to differentiate instruction to address the needs of English language learners in their classes. At the time, Tamara, mid-40s, was a full-time, Associate Professor of Instruction at the

College who had joined the faculty 7 years prior. With over 20 years of experience in higher education and non-profit work, she was hired by the university to design and coordinate these courses and oversee the required field experience. Tal, early 30's, after several years in K-12 bilingual/ESL/literacy education, was finishing her first semester teaching one of the differentiation classes, as well as her doctoral program at the same university. Ann, mid-60s, was a 35-year career educator who began her career an ESL teacher before becoming an administrator. After retiring from her school district, she spent 10 years as Director of Student Teaching and Field Placement at another university, teaching locally and internationally, including online courses.

From these meetings, as well as the consideration of student feedback after many semesters of exclusive face-to-face teaching, described below, the practitioner researchers were motivated to make some substantial changes to these courses:

**Tamara:** *Prior to this project, I had spent years making what I thought were significant changes in the courses to improve student outcomes, as well as respond to feedback from instructors, students, and field-based supervisors. I revised the sequencing of content, reworked assignments, created original materials, used guiding practitioner questions rather than academic labels, and deliberately integrated field experiences with course content. I also tried a modified flipped classroom model, in which I had students completing graded assignments during class.*

At the time, Tamara was also teaching a course focused on intercultural communication for community engagement majors. This course is designed for students who wish to teach English to nonnative speakers outside of the K-12 context. To explore broader implications for the new instructional design, she decided to include this course and invited the newly hired instructor, Erica, to join as well. Erica, late-20's, was a graduate of the TESOL Master's degree program from the same university, was also beginning an administrative position at the university.

## Why "Flip" the Classroom?

Theoretically, the flipped classroom model is a student-centered approach that allows learners to work at their own pace and control how much and when they engage with content. Teachers leverage videos that explain and demonstrate new content that students review prior to class sessions in which this content is applied in practice. While no standard model exists, O'Flaherty and Phillips (2015), suggest that the core features of the flipped learning approach include: "content in advance, educator awareness of students understanding, and higher order learning during class time" (p. 95).

According to Roehl, et al., (2013), flipped classroom approaches increase student-teacher personal engagement by removing the lecture portion from class and allowing for more interactive activities. A study by McLaughlin, et al., (2013), also found that "students from the flipped classroom were more likely than students from the traditional classroom to agree that active student engagement was consistently encouraged by the instructor and that preparation for class was necessary to be successful" (p. 240). Furthermore, Sergis, Sampson and Pelliccione (2018) found "the capacity of the flipped classroom model to free-up classroom time for students' active engagement with collaborative activities scaffolded by their classmates and their teacher has indeed a significant impact on their internal sense of being part of a social content that supports and promotes their learning" (p. 375).

The semesters prior to Ann and Tal joining the instructional team, Tamara worked to incorporate these features into the course. Students were provided content in a variety of formats prior to class sessions, and in-person time was structured around application tasks, often including graded assignments. In-class sessions also included "Community Circles" specifically intended to engage students in collective reflection and planning, as they discussed course content and their experiences in the field.

**Tamara:** *Despite all of this, two challenges persisted that I felt kept students from fully achieving course learning goals: limited student out-of-class preparation before class meetings, and scheduling issues and stress around fieldwork. For the first, students would come prepared to discuss their experiences in the schools, but would not have read or watched the videos assigned with the new content. Thus, these discussions often ended up more as support groups than learning communities. For the latter, scheduling challenges often limited the time they were actually in the K-12 classrooms.*

Throughout the Spring 2018 semester, Tamara, Ann and Tal all followed the modified flipped classroom model and found that they all continued to struggle with issues of limited student engagement. They strategized often in their regular meetings on how to motivate students to complete assigned readings and use provided research-based, peer-reviewed materials rather than "googling" concepts/terms to complete assignments. They tried punitive measures and bribery, entrance cards, paired work, and online check-ins, but none seemed to have any long-term impact.

**Tal:** *Over the semester, I found I spent most class time reviewing and explaining content that I expected my students to read before class. Many students came to class with a surface level understanding of the content. As a result, I wasn't able to engage my students in a deep application and analysis of the content with interactive and engaging conversation and instruction. I started to implement "entrance cards" as a way to hold students accountable to the content but this began to seem more like "busy work" than a strategy to prepare students for higher-level thinking in the classroom.*

Collectively, these practitioner researchers felt limited in their abilities to guide deep exploration of content because they found themselves summarizing assigned texts during class time to fill information gaps, rather than engaging in high-value learning activities such as workshopping, hands-on activities, and rich classroom discussion. Without students devoting proper time and attention to new content, they became stagnant in their development of the higher-tier thinking, reading, and analysis skills required for upper level courses–and in their future careers as educators.

As the practitioner researchers started reviewing research, they found that they were not alone in their observations and experiences, but rather their observations aligned with current trends in the ways today's students access information and approach learning. Seemiller and Grace (2017) write that Generation Z students, or the iGen (defined as individuals born on or after 1993), prefer to engage in hands-on learning opportunities in which they can immediately apply what they learn to real life. According to Gilboy, Heinerichs and Pazzaglia (2015), many of iGen students' attention span declines after the first 10 minutes of class and that the average student retains a small percentage of information during lecture. Related, underachievement in college students has been linked to the inability of students to see the relevance of classroom activities to their chosen careers (Glynn et al., 2009) and lack of a sense of autonomy (Reeve & Jang, 2006; Reeve, 2009). In addition to their desire for applied learning, many iGen students have a preference for intrapersonal learning (Seemiller & Grace, 2017) because they can set their own pace and make meaning of their learning, before having to share that meaning with others. Additionally, many current college students have sizable responsibilities outside of their classes. With the cost of tuition rising by 2.6% each year, many students are full-time students and also part- or full-time workers (Maldonado, 2018). The added component of the field-work requirement of the courses in this project made students' efforts to manage their time and energy even more of a challenge.

**Ann:** *Students were juggling courses, full or part-time jobs, or other obligations, which varied the time they were willing, or able, to invest in the necessary preparations for class. They struggled as they tried to manage their course loads and prioritize assignments. While sometimes motivation was the issue, there were plenty of other barriers to students' engagement in pre-class work.*

For all of these reasons, the practitioner researchers decided that a fully-flipped/hybrid model might be what is needed to address lack of student preparedness and engagement in a positive and effective way, as well as possibly provide some needed flexibility to help students manage the field-requirements.

## Why "Hybrid"?

Similarly to the structure of the flipped classroom model, hybrid courses allow students to become more aware of their own learning process in order to make connections to the course content (Roehl, et al., 2013). The hybrid model has three distinguishing features: (a) online learning activities are used to complement in-person activities; (b) time in the classroom is reduced, but not eliminated; and (c) online and in-person instructional elements of the courses are designed to interact and benefit from the strengths of each (Learning Technology Center, 2014). Hybrid courses "place the primary responsibility of learning on the learner, thus making it the teacher's primary responsibility to create opportunities and foster environments that encourage student learning, rather than simply telling students what they need to know" (Caulfield, 2011, p. 4). The time spent "outside" the classroom does not need to be exclusively technological in nature, rather, the hybrid model lends itself well to other modes, places and opportunities for teaching and learning. In our cases, the time spent outside the classroom includes a fieldwork component in the form of cultural exchange program and student teaching.

The impact the hybrid model has had on student engagement is encouraging. Shea, Joaquin and Wang, (2006) found at the end of the semester 46% of students stated "this hybrid course had more rigorous requirements than face-to-face courses" but an overwhelming majority (79%) agreed that they were motivated to learn in the course (compared to 54% at the beginning of the semester). Additionally, when compared with face-to-face courses, the hybrid model resulted in higher grades and improved learning outcomes (Dowling, Godfrey, & Gyles, 2003), as well as students' perceptions of greater learning and motivation (Leh, 2002; Riffell & Sibley, 2003). Arguably, this shift could be correlated with the ways that the new generation of college students access information and prioritizes school/life demands:

**Tamara:** *This structure, I hoped, would provide students more flexibility in their scheduling of field hours and better achieve what I had tried to do with my modified flipped classroom and would hold students (more) accountable for their own learning. Rather than meeting twice in-person every week, the students meet in-person with the instructor once a week, and complete online tasks (in lieu of the second in-person meeting). The administration was very supportive.*

**Ann:** *When Tamara approached me about 'going hybrid' I was really excited about it, as I had taught a couple of online courses previously and really enjoyed them, but I always missed the regular classroom interaction with students. So the hybrid seemed like a great fit for me.*

On the other hand, Tal and Erica were more tentative to embrace the transition, fearing that less face-to-face time might lead to less learning and might hinder the development of meaningful, positive student-teacher relationships.

**Erica:** *When Tamara offered me a course to teach, I was really excited. When I found out it would be a hybrid course, I was intrigued, but hesitant. I always really enjoyed teaching and learning in the (traditional) face-to-face format, both in my experiences as a student and a teacher.*

**Tal:** *When I spoke with Tamara, I was initially extremely against the idea of teaching using a hybrid format. My teaching philosophy supports face-to-face interaction, especially with pre-service teachers who lack classroom experience. I also didn't have any online teaching experience so the idea was very new to me. However, once Tamara presented the format to me, I thought that challenging my students to think critically was a very significant component to this model and I was much more receptive to the transition.*

Ranging from fully 'on-board' to quite reluctant, the four practitioner researchers committed to working together on this effort. They knew redesigning the courses would require a full reconceptualization of teaching, learning, and assessments; and that they would need to work closely together to be successful in the transition and implementation. As Peercy and Cramer (2011) note "successful hybrid teaching cannot be a mish-mash of traditional lecturing with some online content, but rather a thoughtful re-design of course pedagogy and meaningful interactions with students" (p. 628). So, the practitioner researchers began to consider the changes to the course that would meaningfully engage students with the content, foster a strong learning community, and support students' immediate needs and long-term goals. Their goal was to do this in a way that would allow for collaboration, utilize best practices in instructional delivery (to meet course learning targets), and provide the flexibility needed in students' (and our own) work and busy personal schedules.

## The PANDA Model: A Blend of Hybrid and Flipped Classrooms

The greatest hopes for these practitioner researchers in transitioning from traditional face-to-face courses was to motivate students to prepare for class, provide guided opportunities for students to link content in practice, and maximize in-class time. As mentioned above, their experience with flipping the classroom alone did not yield great success in student engagement. Much of this they attributed to a lack of accountability measures that ensured students completed the out-of-class material review prior to meeting, or take responsibility for their individual learning experiences (Roehl, et al., 2013). As anticipated by Gilboy, et. al. (2015), without this, students often arrived not fully prepared for the in-person active learning strategies. For some students, their demanding schedules limited their ability to complete the work, for others they had become accustomed to passive learning and participation, and for others, it was some combination of both.

Appreciating the intense time commitment of faculty to prepare and develop course content (O'Flaherty & Phillips, 2015). the four practitioner researchers agreed to collaborate and create a shared model, then work in pairs to adapt individual courses that would address the challenge areas previously identified.. They met and shared resources over the summer to ensure collaboration. Our resultant model, dubbed the PANDA model, is a blend of both the hybrid and flipped models (see Table 1). It requires students to complete authentic tasks to demonstrate deep understanding and mastery of content (Practice and Apply), explore new content prior to class meetings (New), and actively participate during class time in application and exploration tasks collaboratively, using new content and out-of-class experiences (Discuss and Analyze). The PANDA model draws on Vygotsky's (1978) zone of proximal development defined as "the distance between the actual developmental level as determined through independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86).

Specifically, students are assessed on what they are able to do individually and are subsequently provided scaffolding by the instructor and peers to advance their skills. In the week between each in-person class session, students are asked to apply and extend the content from the prior class through an online practice and apply assignment. These might be lesson planning, text analysis, or journals with peer responses. In that same week, students are tasked with reading/watching the new content for the upcoming class and completing an online comprehension "check in." To facilitate their success, students are able to take this assessment in their own time and at their own speed (McLaughlin, et al., 2013). The practitioner researchers also provide opportunities for students to meet with or contact their instructor for clarity or assistance with key concepts and retake the new content check-in if they had difficulties. After the due date, the instructors grade the new content check-in and use the results to gauge students' levels of understanding and plan collaborative learning activities for the upcoming in-person class session. During class meetings, the students engage with their peers and instructor through analytical activities, whole class discussions, and small group/pair work. Then, after class, students have the following week to complete the post- and pre-class online assignments in preparation for the next in-person meeting. (See Westermann (2014) for a similar model designed for history courses)

Once the shared model was developed, the practitioner researchers began working closely in pairs to focus on our individual classes. Tamara and Erica were each teaching a section of the intercultural communications course, while Tal and Anne worked together, teaching courses that focused on different grade levels, but the content, sequence and assignments of their courses were very similar. Each pair collaborated throughout the months of summer 2018, identifying academic texts, readings, podcasts, videos, etc. that aligned directly with the weekly content, creating assignments, and sequencing to maintain connections from week-to-week.

*Table 1. The PANDA Model*

| | | | |
|---|---|---|---|
| **Practice and Apply** (prior week's content) | Online | Students apply and reflect on their new knowledge/skills through journals, papers, quizzes, etc. | Graded Assignments |
| **New Content** | Online | Students view and/or read provided texts, videos, podcasts and complete short comprehension task | Graded Assignments |
| **Discuss and Analyze** (new content) | In-Person | Students participate in class activities, including discussions, teaching practice, problem-solving, planning, etc. | Participation/Attendance Grade<br>Occasional graded assignment (i.e. group presentations) |

**Anne:** *Tal and I had taught the course face-to-face in the prior semester. First, we went back to our syllabus for the face-to-face course to determine what content we wanted students to focus on. Once we determined the new content, we worked backwards. We thought strategically about how the practice and apply assignments could scaffold students for more significant assignments and in the field.*

**Tal:** *The practice and apply assignments were a significant focus for me since they provided opportunities to guide and scaffold students through a process. For example, one assignment in our course is for students to create and teach a whole group lesson plan in the field, modifying for the English Language Learners (ELL) in the classroom. Therefore, one practice and apply assignment focused on writing ELL inclusive content objectives. Another practice and apply assignment asked students to record a video of themselves practicing giving procedural directions to students using comprehensible input strategies. Another practice and apply focused on differentiating assessments for ELL students. Once we decided on the practice and apply assignments, we were able to plan out our interactive activities for class meetings in connection to the practice and apply assignments.*

Aligning with best-practices, the course materials included different modalities including podcasts, videos, and readings (Roehl, et al., 2013). Additionally, the practitioner researchers felt it necessary to build critical reading skills among their students and expand their ability to access information in different formats.

**Erica:** *We included several deep, academic texts, as well as some short readings/articles, brief YouTube videos, Ted Talks, and podcasts. There were a variety of ways in which the material were presented to students rather than just having one textbook. The content was hand-picked to match the topics directly, rather than trying to assign one book and try to make it work for all desired topics.*

**Tamara:** *We wanted the check-in to not only facilitate students abilities to read/watch and understand the content presented in the different modalities, but also to start making links between the text and prior materials, their experiences, and their career goals. We learned to word the questions by asking for original examples, to help us see how they were approaching the content, as well as asking for students to identify common themes and differences across specific readings and videos. We also provided a space at the end (no point value) in which students could self-identify areas they would like further explained or clarified.*

Throughout the semester, the pairs met frequently to discuss course progress. The practitioner researchers adapted, as needed, based on our experiences online, in the classroom, as well as based on student feedback and work products. Additionally, the practitioner researchers shared materials and assignment descriptions, and brainstormed ways to address students' questions, concerns, and needs as they learned the new format.

## PRACTITIONER RESEARCHER PERSPECTIVES

From the onset of the Fall 2018 semester, the practitioner researchers anticipated that students would uncomfortably find that the model required more time and work than their traditional face-to-face classes.

To support students' efforts to balance their out-of-class commitments and course requirements, all of the course assignments were due on the same day each week, and the content check-ins and practice and apply assignments were always due on the same day and time, each week. The consistent due dates eventually helped students better pace through the module every week. However, it took some time for this to fully catch on.

**Ann:** *The initial level of engagement spanned a range from students who thrived with this hybrid format and those who had difficulty managing it all. To help struggling students, I did a lot of accommodating, clarifying, proactively creating organizational charts with assignments, due dates, etc. that made it easier for students to keep track of what they needed to do and by when.*

**Tamara:** *Near the beginning of the semester, a few students complained that the format did not work for them. Several suggested to me that it would be better for them if I would provide a lecture on the new content material before they had to do the "check in" assignment.*

As the semester progressed, the practitioner researchers observed notable differences in not only student preparation for class, but also accountability to the content (Roehl, et al., 2013). Through the content check-ins, they were able to assess student misunderstandings and then strategically focus instruction on key concepts when they met in person, rather than wasting valuable class time reviewing all of the content. Additionally, they found, students were much more prepared and willing to engage in complicated, nuanced conversation during class meetings.

**Tamara:** *For the first few weeks, it seemed that students attempted to do the check-ins without fully reading/watching the assigned texts/videos. But, that ended once students started seeing this impact their grade. This, to me, was a strong indication that the format works to get students to be more accountable for their learning.*

**Tal:** *The content check-ins before class meetings were a way for students to hold themselves accountable and gauge their own understanding of the content. The check-ins also indicated that students were more invested in the content. I was able to spend class time fostering student collaboration and critical analysis of the content through discussion and interactive activities.*

**Erica:** *Because there were about 36 hours between the time the online assignments were due and the face-to-face time, it really gave me time to look closely at the online submissions and think critically about how to prepare or adjust my focus for the upcoming class. What did students get? What did they miss? Where do I need to shift my focus? That was critical for me as a new-to-higher-ed instructor… I can't imagine teaching without it now!*

**Ann:** *Because this hybrid format was new for most students, it was helpful to use the first few minutes of face-to-face class time in small "accountability" groups for processing the new content, and to learn from each other. Students quickly began to connect with each other, as well. This was another layer of accountability as a "community of learners."*

By mid-semester, it seemed most students were "used to" thinking ahead, reflecting and drawing connections across the week's content, and noticing how the weekly modules build on each other. Students were assessed on the content at a smaller point value, but after the class, together,, delved deeper into the material during face-to-face time, students were then assessed at a higher point value in the practice and apply assignment.

**Erica:** *It felt like having one foot in one week, one foot in the next. I felt comfortable with the format after the first few weeks, always thinking back, always thinking ahead, which certainly isn't new for teachers, but this model took it to a new level I had not really done previously in my teaching.*

**Tal:** *Many of my students appreciated that the content check-ins were always due on Tuesday nights, class meetings were every Wednesday and the practice and apply assignments were always due on Sunday night. On my end, I had plenty of time to grade assignments and address any misconceptions in the following class meeting.*

By the end of the semester, aligned with the findings of Caulfield (2011), all practitioner researchers found that the hybrid model included less "teacher-led" instruction and more "student-run" learning, while also promoting more face-to-face and online student-to-student interactions, and opportunities for relationship building (though not immediately, and not for all students). Even more, the instructors overwhelmingly agree fostering teacher-student relationships and engaging students was a strength of the PANDA model. According to Roehl, et al., (2013) student-teacher personal connections increases because the lecture portion from class is removed, allowing for more interactive activities. Additionally, a common trend was the online components of this model gave students who do not generally participate as often in face-to-face, more opportunity to have a voice.

**Erica:** *I was able to get to know students VERY quickly through open-ended answers in the online assignments, which allowed me to see their ways of thinking, their level of understanding of material, and their level of interest/engagement in the core theme/topics of each week. Many students showcased their deep understanding via online submissions and were often on the quieter side in class.*

**Tal:** *I had more time in class to meet with small groups or individual students and answer their specific questions. I was able to use the "online" day as office hours. I sat in the assigned classroom and students dropped in as needed for support in the course or with their fieldwork. This gave me an opportunity to have individual conversations with students that I didn't necessarily have in the face-to-face format.*

**Tamara:** *I think that being able to see how students are engaging with the texts before discussing in class allowed me to identify some star students who otherwise would have been rather unnoticed because their participation in class is limited.*

**Ann:** *We always want to really "know" our students and to use those connections to teach them well. Having an opportunity to engage with students throughout the week both online and face-to-face really helped to develop a deeper understanding of them as learners, and for them to know me as their instructor, as well.*

Through this process, it became clear just how important it is to orient students to the format and how to navigate the university's learning management site before beginning to teach content. With the recent development of learning management systems such as Blackboard or Canvas has become a norm. However, the extent to which it is used to deliver content or "house and organize material efficiently" (Hurlbut, 2018, p. 4) can vary greatly. As a result, students came to their classes with a wide range of comfort levels and abilities in navigating the system and engaging with the content. While some caught on quickly, a handful of students continued to find the format challenging, particularly if they missed more than one of the assignments. In one case, a student had to drop the course for this reason. From this, the practitioner researchers learned that they overestimated students' levels of media literacy and abilities to navigate online learning—and in the reading and using of academic texts in particular. This was also reflected in the post-course student surveys.

## STUDENT PERSPECTIVES

Upon completion of the Fall 2018 semester, the researchers asked students in all four courses to take a survey about the structure and implementation of their course, as well as their attitudes towards online learning in general. They anticipated that the hybrid design was very new and often times uncomfortable for students. It was a pleasant surprise to learn that 72% students indicated that they felt comfortable with the hybrid format "right away" or "after a few weeks." In the open-ended questions, students stated the PANDA model helped them remain organized throughout the semester and that the format provided them with munch needed flexibility to work at their own pace. The students appreciated the clear expectations that the instructors offered from the beginning of each course, and really enjoyed the course content itself. Students also stated that they appreciated the "structured flexibility" which allowed them to complete their assignments and out-of-class fieldwork component at their own pace every week. Students, of course, also enjoyed "being off" from class one day, and many noted how they used this time productively to meet fieldwork requirements. The PANDA model helped them remain organized throughout the semester and the format provided them with much needed flexibility to work at their own pace.

Since students were responsible for their initial introduction to the new content and provided high quality resources, the practitioner researchers expected that learners would find this model fostered their critical reading skills. Among the responders, 54% agreed or strongly agreed that it made them a more critical reader of academic texts. Many students also appreciated (online) accountability factor of their peers, stating: "the online part made everyone have to read and prepare for the classes. This made the conversations flow much more." As a result, time in class felt more "purposeful."

Among those who indicated lower levels of comfort and/or critical reading skill building, most indicated that this was their first experience with a hybrid or online model. Within this group, some found the PANDA model helped them remain organized throughout the semester and that the format provided them with munch needed flexibility to work at their own pace. Others were frustrated, often because the students underestimated the expectations in workload and time commitment for the online component. Some students had admittedly become accustomed to not preparing for class thoroughly and relying on the instructor to lecture on the information. Unlike traditional face-to-face classes, the hybrid model does not allow for instructors to "spoon-feed" content to students, rather, it creates a student-centered learning environment where they become "active knowledge seekers" (Caulfield, 2011, p. 4).

Additionally, 68% of students stated that their PANDA structured course had more assigned videos and readings than traditional face-to-face classes. In open-ended questions, some students shared that stated that the "heaviness" and "denseness" of the texts were a challenge and that they felt it was "unfair" to assess students for point-value before discussing the material as a whole class. For others this was less of a concern, particularly among those who had previously taken research methods courses and were more experienced with academic texts. In the end, 61% of students agree or strongly agree "(they) would register for a hybrid course in the future."

## LEARNINGS AND APPLICATIONS FOR FUTURE PRACTICE

The frustrations and concerns expressed by many college instructors about the levels of student engagement in their face-to-face courses are not terribly surprising given the current trends in the ways today's students access information–and their attitudes and approaches to learning. While transitioning from face-to-face to the hybrid model may be a research-supported solution, it is not always smooth for instructors, nor easy for students. Yet, based on their experiences as the practitioner researchers and student feedback, it *is* worth the effort. In using this model, students become more independent problem solvers and thinkers, show more accountability to the content, and are more prepared for higher order conversations and activities in class (Gilboy, et al., 2015; O'Flaherty & Phillips (2015). This model proved to be particularly useful for students that have an additional outside of course requirement (i.e. fieldwork and the cultural exchange program) in addition to their other out of school life demands.

Patience and flexibility are extremely important in the process of transitioning from traditional classroom structures to the PANDA model, as well as in the initial implementation. The authors also offer the following recommendations:

- Select a course you are already experienced in teaching.
- Collaborate with a co-teacher or co-planner to help with the distribution of the workload.
- Give yourself, and your co-planners, adequate time to map out the course before the start of the term, then be prepared to make adjustments throughout the semester, as needed, based on student feedback and work products.
- Be mindful of what activities and tasks are best suited for online learning and which are best for the in-person class sessions.
- Be explicit in all directions provided online as well as in-class. Give and request examples to facilitate students' deep understanding of content and the assignments.
- Be consistent in the dates and times assignments are due throughout the course to help both practitioner researchers and students alike stay organized and manage their time.
- Create a video to demonstrate how the course is structured and how to find materials and assignments.

## CONCLUSION

In sum, the university practitioner researchers who participated in this project agree that the PANDA flipped/hybrid model not only made students more accountable for their learning, but also elevated the quality and quantity of engagement they had with their peers and instructors throughout the semester. At many public urban institution, students often have limited resources and face enormous demands on their time and energy outside of school. The instructional design of the course and reduction of class meeting time gave students the space needed to progress at their own rate, meet field requirements, and provided opportunities for more meaningfully interactions with the content before and after the in-person meetings. Specifically, the out of class, online work included accountability check-ins but also required students to apply content to carefully designed tasks– solidifying their understanding and skills on a weekly basis.

As students themselves attested, this model allowed them to benefit more from their instructor's expertise, as learning facilitators, rather than straight lecture. Tal and Erica, who feared that replacing face-to-face time with online learning might hinder the development of relationships, actually found that it led to deeper, more meaningful relationships with students, including building relationships with students who were often on the quieter side during face-to-face time. All four practitioner researchers agree that developing a course from face-to-face to a hybrid is initially very time consuming, however, this investment has the promise to facilitate a deeper level of student engagement with course content and provided the needed flexibility for them to meet their out of school life demands and achieve their educational goals. These practitioner researchers enthusiastically encourage others to try this model and look forward to applying what they have learned in future practice.

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## KEY TERMS AND DEFINITIONS

**Face-to-Face Classrooms:** Traditional in-person courses in which instructors and students meet in the same physical space.

**Flipped Classrooms:** Introducing/delivering new instructional content outside of class, before face-to-face classroom meetings. Face-to-face meetings focus on applications of new content.

**Hybrid Courses:** Courses in which students and instructors meet for face-to-face instructional time for part of the term and meet or complete online learning tasks for the other part.

**Learning Management Systems (LMS):** Software or website used by colleges and universities to facilitate learning, house content, and administer assessments in higher education courses.

**Online Learning:** Technologically-mediated instruction.

**PANDA Model:** A blend of both hybrid and flipped models, designed by the practitioner researchers of this chapter to maximize student engagement during both online and face-to-face instructional time (practice/apply, new [content], discuss/analyze).

# Chapter 3
# TAM + ARCS = SNT Framework for Higher Education

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## ABSTRACT

*This chapter studies the challenge and issue of developing a sound social networking technology (SNT) framework to affect positive student engagement and consequently effective learning. The author aims to enable educational administrators, faculty, and curriculum designers to incorporate and seamlessly integrate SNT in curricula to foster effective and efficient learning. The chapter bases itself on the premise that higher educational institutions failing to develop and integrate social educational technology in their educational systems and policies will face major maintenance and existence issues. Contemporary dynamic technology, diverse learner populations coupled with different types of learning environments, and learning connotations necessitate the need for a robust SNT framework. The author researches the task technology fit (TTF) framework, discusses theories of TAM and ARCS, describes SNT of Twitter and Facebook, and uses a qualitative case study to develop and craft a SNT framework for higher education.*

## INTRODUCTION

Contemporary US education systems are dominated by 'digital natives' learners who are knowledge and performance oriented. These digital natives demand and expect technology in all its forms to be a part of the face-to-face, hybrid, or online classroom enabling them to access information and enhance knowledge and skills at their convenience (Pradia, 2016). Digital natives have grown up with technology such as cell phones, Internet, social networking tools, web 2.0 applications, wikis, and social bookmarking (Schindler, Burkholder, Morad, & Marsh, 2017). The increased use of technology in K12 and higher education classrooms has gradually led to the emergence and dominance of a technologically oriented educational culture (Center for Post-Secondary Research, 2017). The challenge for educational institutions has become to stay abreast of current dynamic flexible educational technology. It has become imperative to engage varied learner populations at all levels with stimulating online content and technology encouraging communications, connections, reflections, sharing, participation, and collaboration (Echung & Usoro, 2016).

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In their annual reports, the Community College of Student Engagement (CCSE) and the Center for Post-Secondary Research stated contemporary learners desire a need to establish connections to facilitate sharing, engagement, and collaboration to foster meaningful, active learning (Fırat, Kılınç & Yüzer, 2018). Over the past seven years, the number of social networking apps, and Google sharing has increased from 5000 to 1.75% (Schindler et al., 2017). The number of university students using Facebook for academic purposes has grown from 16% to 95%, while Twitter users in academic universities have increased from 27% to 91% (Naghdipour & Eldridge, 2016; Williams & Whiting, 2016). The increased usage of social networking technology (SNT) such as Facebook and Twitter have created a pedagogical and instructional gap (Chawinga, 2017). Web 2.0 social technology offers an institutional structure not bound by traditional boundaries of higher education systems, and has the potential to reach and impact different learner populations (Pradia, 2016). Limited shelf life of new technologies including learning management systems (LMS) coupled with institutional barriers of budget, faculty beliefs, perceptions, and an absence of an appropriate technologically oriented pedagogy compounds the challenge of successfully integrating and implementing instructional technology in higher education (Schindler et al., 2017). According to educational administrators, faculty, and curriculum developers the primary goal of SNT was to enable creation of online public profiles, empower social friendships and exchange of information (Chawinga, 2017). SNT was not seen as an active learning medium empowering active learning. SNT applications of Facebook, Twitter, Instagram, were not identified as ways of increasing effective student engagement where learners could determine their learning through dialogue, and presence (Naghdipour & Eldridge, 2016). Universities failing to integrate appropriate SNT applications in their learning environments to enrich student learning experiences by improving student outcomes of a dynamic diverse student body have had to cope with dwindling enrollment numbers (Wingo, Ivankova & Moss, 2017). Universities need to adopt a continuous design model to seamlessly integrate curricula with appropriate instructional technology to increase student engagement, and lifelong learning.

The key elements needed are SNT, effective design model, and student engagement. The author aims to combine all three elements by aligning two disparate theories of, (a) the information systems theory of technology acceptance (TAM), and (b) the Instructional Design (ID) motivational theory of Attention, Relevance, Confidence, Satisfaction (ARCS) to develop a SNT framework. The objective is to develop a sound SNT framework to effect positive levels of student engagement, and meaningful effective learning. The SNT framework will guide and help educational administrators, faculty, and curriculum developers in framing curricula embedded with appropriate social instructional technology enabling effective student engagement and active meaningful learning. Written with a scholarly-practitioner perspective, the author hopes to pique academic scholarly discourse and further empirical research investigations. The author provides a basic foundation of a) student engagement, b) SNT, and c) theoretical frameworks of TAM and ARCS. The author combines the theory of TAM with ARCS to develop a SNT model for fostering effective student engagement in diverse learning environments. The SNT model will serve as a blueprint for higher education classrooms in developing, engaging, and nurturing global critical thinking citizens.

## BACKGROUND

### Student Engagement

The term 'student engagement' has its historic roots entrenched in the late 1980's and mid 1990s primarily in the works of Ralph Tyler and Alexander Astin (Trowler, 2010; Schindler et al., 2017). These scholars identified student engagement as student involvement focusing on student experiences, attitudes, perceptions, and research (Trowler, 2010). Contemporary US scholarly literature emphasizes a focus on not only knowledge and skill acquisition, but Knowledge, Skills, and Attitudes (KSA) applications and transference to develop students into global and productive citizens (Firat et al., 2018). Student engagement in contemporary education systems has a dual thrust focusing on pedagogy, technology, and how students learn from these different methods (Schindler, et al., 2017). Student engagement has come to revolve around student, institution, and faculty initiatives on how to learn and develop learning environments enabling efficient and effective knowledge, technology, and a performance-oriented economy (Center for Post-Secondary Research, 2017). Student engagement is a concept and a process, a transient state of learning where the learner progresses to a higher state of knowledge analysis and synthesis leading to creative problem-solving (Leach, 2016). The typology of student engagement classifies the concept and process of student engagement into four dynamic states (Coates, 2007; Center for Post-Secondary Research, 2017). The process of student engagement progresses in four stages influenced by two elements of academic, and social. Learners move from one state to the other throughout the learning cycle irrespective of their level and type of education. The academic element denotes a characteristic of scholarly thought and independence driven by intrinsic motivation of satisfaction and mastery. The social element indicates communication, teamwork, and connections shaped by external motivators of grades, and awards (Firat et al., 2018). Combination of the two elements leads to four related states of:

- Intense student engagement: This is the highest and most evolved form of student engagement. Learners view themselves as co-instructors and equal participants in the learning process. They regard themselves as being responsible for development, implementation, evaluation of a learning environment and curricula. Intense student engagement relates to independent thought having the ability and capacity to communicate with other learners, faculty, and staff to develop individual schema of KSA (Coates, 2007; Leach, 2016).
- Independent student engagement: This state signifies a state of independence in action and behavior. Independent learners are highly intrinsically motivated and fueled by a need to acquire, adapt, and modify their KSA to various workplaces. Such learners see themselves as part of a whole – they communicate and exchange KSA to engage in independent study processes (Coates, 2007; Leach, 2016).
- Collaborative student engagement: This state of student engagement is influenced greatly by the social element. Learners acquire, explore, assimilate, analyze, and accommodate KSA for holistic synthesis of knowledge. Collaborative learners communicate, connect, and exchange ideas/ information with each other to evolve to higher states of student engagement. Collaborative learners rely on colleagues, teachers, curricula, and educational technology to guide and scaffold them to accommodate and synthesize KSA as a whole (Leach, 2016).

- Passive student engagement: In this primal state of student engagement, learners are receptacles of KSA delivered by teachers. Such learners do not ask questions and participate in the classroom (Leach, 2016).

Usually learners are in the passive state of student engagement in kindergarten and gradually move from one state to the other as they progress though school, university, and even workplace training. It is not possible for any learner to jump from passive state directly to intense state. Learners have to go through each state to reach the highest state of student engagement of intense. Current higher education systems in North America place student engagement levels at independent and collaborative (Center for Post-Secondary Research, 2017). Student engagement states are also impacted by all three dimensions in different ways (Center for Post-Secondary Research, 2017; Witkowski & Cornell, 2015). Table 1 lists the three dimensions, the dimensional components of each, and the state of student engagement experienced in each dimension.

As can be seen in Table 1 the absence of the fourth state of student engagement i.e. passive state indicates lack of student involvement and engagement on any dimension. Learners merely receive the information, assimilate it in the classroom and fail to engage with the content and faculty at any level. On the other end of the continuum is the cognitive dimension engaging learners in an intense and independent state. It is important to remember that unlike student engagement dimensions that are static in nature, states are dynamic and a process in the cycle of student engagement. Thus, at a single point of time a learner can be in intense and independent state but can embody components of only one dimension. The three dimensions have overlapping components signifying a learner can display two or more states at a time. Thus, it has become imperative to develop student engagement at the collaborative state to allow learners to advance to intense and independent states. In a longitudinal research study titled *'Project Tomorrow'* in 2010, scholars observed the use of educational technology increased student engagement at all three dimensions of behavioral, emotional, and cognitive. It led to improved student learning, and increased sense of ownership of KSA by the learners (Clements, 2015; Schindler et al., 2017). The following section provides a brief description of Facebook and Twitter SNT.

## Social Networking Technology (SNT)

The original definition of SNT as 'the practice of expanding knowledge by making connections with individual of similar interests' is still current and topical today (Gunawardena, Hermans, Sanchez, Richmond, Bohley & Tuttle, 2009; Schindler et al., 2017). The aim of SNT to make connections with peers and faculty to effect student engagement and communication remains important (Schindler et al., 2017). The commonly used SNT are Facebook and Twitter.

*Table 1. Student engagement dimensions (Schindler et al., 2017)*

| Dimensions | Components | States |
|---|---|---|
| Behavioral | Participation + Dialogue + Dialogue with peers, faculty, and staff + Responsibility + Independent thought | Intense/ Collaborative |
| Emotional | Attitudes, values + Sense of Responsibility/Belonging + Communication | Collaborative |
| Cognitive | Intrinsic Motivation + Satisfaction + Independent Scholarly action/thought + Participation + Responsibility + Collaboration | Independence/ Intense |

## Facebook

It is described as a web-based service allowing individuals to create public, personal, and/or professional profiles and post comments to connect and interact with each other (Naghdipour & Eldridge, 2016). Its use in the academic educational context was originally seen as a supplementary optional instructional tool for class lectures and LMSs to support discussions, and share academic content (Camus, Hurt, Larson, & Prevost, 2016). The Facebook link is integrated into curricula as an external link for students to go the public website to participate in the class lecture, or discussion (Camus et al., 2016). Private study and class groups were created enabling students to log into these groups on Facebook to interact with each other (Camus et al., 2016). However, Facebook, being an optional instructional tool, is subject to the whims and voluntary behavior of students. Voluntary participation levels ranged from 16% to 91% with an average rate of participation at 47% (Camus et al., 2016; Nagdhipour & Eldridge, 2016). Participation levels were measured and evaluated by tracking the number of students joining and logging into the course and/ or university specific Facebook groups, visiting course-specific Facebook pages, and/or posting at least once on a course-specific page (Camus et al., 2016). Participation levels were recorded at 10% when Facebook was incorporated into the LMS as an external app. Students had to download the app called 'Schools app' to connect to the university Facebook group and/ or site (Camus et al.,2016). This required effort and did not appeal to students. According to recent survey results, participation levels rose to 95% where the instructor seamlessly integrated a Facebook page within the LMS. The instructor downloaded Facebook onto the LMS and created a course-specific site and group. The page, then remained a course activity in the LMS and students did not have to upload or download anything (Nagdhipour & Eldridge, 2016). Another study showed mandatory participation was more successful than voluntary participation (Clements, 2015). Students participated more when the course material posted on the Facebook page was deemed relevant and useful by the students. For instance, students were more likely to visit and participate in class discussions on Facebook providing exam related information, inquire and share information on KSA (Schindler et al., 2017). Students identified Facebook as a common space for collaboration, exchange of ideas, problem-solving, and communication (Schindler et al., 2017). Facebook in the contemporary classroom was seen as a social app with far-reaching educational impact and potential. Facebook engages students by prompting an active dialogue and imparting a sense of belonging, ownership, and discussion (Schindler et al., 2017). Students who regularly use Facebook for class discussions report increased academic grade performance, content mastery leading to pattern identification and creative problem solving (Schindler et al., 2017). Facebook academic users connect and interact with each other to analyze, synthesize KSA at a group level (Schindler et al., 2017).

## Twitter

It is a web-based service where subscribers can post messages in the form of tweets. Tweets may contain hyperlinks to other external websites, images, graphics, and videos tagged by topic using the hashtag symbol before the designated label e.g. #elearning (West, Moore, & Barry, 2015). Subscribers and users can 'follow' each other and post tweets enabling a healthy discussion (West et al., 2015). In the academic realm, Twitter has a wider reach due to its brevity (Schindler et al., 2017). Similar to Facebook, faculty and staff recorded high student participation rates when participation was deemed mandatory (William & Whiting, 2016). The Twitter link was incorporated within class curricula as an external link and it was the responsibility of the student to log into the external site, follow the instructor and peers and even tweet to remain in class and get a good grade (William & Whiting, 2016). Instructors used Twitter to post messages about assignments and attendance policies making it compulsory for students to log into Twitter and view the page (Hennessy, Kirkpatrick, Smith, & Border, 2016). Students had the option of either just viewing the page and not tweeting, or creating an account to tweet their reactions and opinions (Hennessey et al., 2016).

In a research study involving the mandatory use of Twitter for only one semester, student participation rates logged at 91% (Henessey et al., 2016). But in another similar research study, voluntary student participation logged at 36% (Hennessey et al., 2016). The difference in participation was that Twitter was incorporated into the LMS in the former instance. This seamless integration into class curricula enabled ease of access and familiarity prompting more students to log into Twitter. Twitter was seen as less threatening than talking aloud in class, and at the same time concise allowing shy non-committal students the opportunity to share their views. Moreover, Twitter activities were done in class or on class time enabling monitoring of the activity by instructors (William & Whiting, 2016). However, such Twitter learning activities were ungraded impacting student motivation levels. Students were compelled to log, view, and sometimes even tweet without incentive of a grade (William & Whiting, 2016). Student participation rates could increase by more than 45% if Twitter activities were graded (Firat et al., 2018).

Twitter, in contemporary classrooms, fosters high student engagement levels as it enables constant interaction, brief messages and dialogue appealing to many students. Students may have an idea but feel hesitant to share it in explanatory detail (Schindler et al., 2017). On the Twitter page, they feel comfortable to post an idea without explaining it. Tweets and retweets enable KSA accommodation and assimilation fostering knowledge promotion and individual schema development (Schindler et al., 2017). Students interact and communicate with each other, developing content ownership and sense of responsibility (Schindler et al., 2017). Table 2 shows the states and dimensions of student engagement of Facebook and Twitter.

## THEORITICAL FRAMEWORKS

### Task-Technology Fit (TTF)

The TTF model cites task and technology characteristics determine level and manner of technology usage and performance (Lai, 2017; Marangunić & Granić, 2015). Task characteristics refer to the type of activity or course (Goodhue & Thompson, 1995; Lai, 2017). Technology characteristics denote the type of technology used. Both task and technology influence each other to shape and effect performance learning and technology usage (Wingo et al., 2017; Lai, 2017). Task and technology characteristics combine to impact technology usage and performance/ productivity. Task characteristics are determined

*Table 2. SNT and Student Engagement (Schindler et al., 2017)*

| SNT | Dimensions of student engagement | States of student engagement |
|---|---|---|
| Facebook | Behavioral + Emotional | Collaborative + Independent |
| Twitter | Behavioral + Emotional + Cognitive | Collaborative + Intense + Independent |

by the motivational theory of ARCS i.e. attention, relevance, confidence, and satisfaction. TAM and ARCS constitute two halves of the whole construct of TTF impacting performance learning, student engagement, and technology usage.

## Technology Acceptance Model (TAM)

TAM was originally developed in 1989 as an information-systems theory to predict use and acceptance of information systems and technology by individual users (Davis, 1989; Surendran, 2012). TAM is used primarily in the field of information technology to explain and predict technical factors such as quality and level of technology, type of technology (Wingo & Moss, 2017). The model is also used to understand individual characteristics of perception, user experience, and prior technology knowledge (Wingo & Moss, 2017). TAM has recently come to the forefront due to an increasing dominance of Web 2.0 and SNT (Marangunić, & Granić, 2015). Based on a meta-review and analysis of 85 industries using TAM, the researchers stated that TAM was a universal model of technology used and applied in any professional, academic, or personal field; 'TAM has evolved to become the key model in understanding the predictors of human behaviour towards potential acceptance or rejection of the technology (Marangunić, & Granić, 2015: 92). The researchers humanized TAM placing equal emphasis on the end outcome of TAM (Marangunić, & Granić, 2015). They stated that TAM existed due to individual peculiar behaviour, and perception. TAM also included characteristics determining the level of acceptance and usage of a particular technology (Marangunić, & Granić, 2015).

The dimension of technology has two constructs of a) perceived usefulness (PU), and b) perceived ease of use (PUE) (Davis, 1989; Surendran, 2012; Wingo & Moss, 2017). PU denotes the user's likelihood of using a certain technology will produce a benefit (Wingo & Moss, 2017). PU is a technology's potential use to produce optimal performance/ productivity and/ or benefit (Davis, Bogozzi & Warshaw, 1989). For instance, a user evaluates the potential benefit of Google Apps. before using it. The latter construct of PEU refers to the degree or extent a user expects a technology to be effortless (Davis et al., 1989). A user is more likely to choose and use a technology if he/ she thinks the particular technology will benefit him/ her, and requires him/her to exert minimal effort while using it. TAM is influenced by external variables or constructs such as an individual's KSA (Davis, 1989; Davis et al., 1989). The three elements or constructs of PEU, PU, and external variables (EV) shape attitude and intent to use technology impacting actual usage of technology. The model was further developed to distinguish the determinants and/ or components of EV (Venkatesh & Davis, 2000). The researchers, based on four longitudinal studies at various sites, determined that EV influencing PEU and PU comprised of a) social influence processes, and b) cognitive instrumental processes (Venkatesh & Davis, 2000: 187). The former construct comprised of individual and societal behavior and attitude i.e. norms, voluntariness and image. The latter construct included cognitive thought and action processes of job quality, relevance, result and productivity (Venkatesh & Davis, 2000). The modified model did away with the combined ambiguous element of EV replacing it with individual and societal behavioral and cognitive constructs (Lai, 2017). Additional variables of user enjoyment, comfort, cognitive absorption, and peer influence emphasizing user individual characteristics of motivation were added to TAM to extend its operability beyond the information systems field (Surendran, 2012; Wingo & Moss, 2017). TAM underwent a further modification when constructs and factors of PEU and PU were developed and explained on four different dimensions of a) individual differences, b) system characteristics, c) social influences, and d) facilitating conditions (Lai, 2017).

## ARCS

Originally developed by John Keller in 1979 as a motivational learning theory, ARCS is defined as 'the process of arranging resources and procedures to bring about changes in people's motivation' (Keller, 2010: 22). The aim of ARCS is how to increase learner motivation and consequently learner performance and productivity (Keller, 2010; Fritea & Opre, 2015). Motivation has been defined as 'the process whereby goal-directed activities are initiated and sustained' (Cook & Artino, 2016: 997). In his book titled *Motivational Design for Learning and Performance- The ARCS Model Approach*, Keller defined motivation as 'the goals people choose to pursue and how actively or intensely they pursue them' (Keller, 2010: 4). He identified two types of motivation (Keller, 2010; Craig, 2018).

- Extrinsic motivation People engage in extrinsic motivation when their activities and/ or behaviors are rewarded (Keller, 2010; Craig, 2018). For instance, students who do well on exams do so to complete their degree, advance to the next level of their degree program, and/or for a good grade (Craig, 2018).
- Intrinsic motivation: Activities and behaviors occurring for the pleasure of the activity itself is identified as intrinsic motivated behavior (Keller, 2010; Craig, 2018). Intrinsically motivated activities and behaviors do not need any type of material reinforcement or reward. For instance, the activity of learning to acquire mastery and feeling competent or the activity of reading for the pleasure of relaxing and enjoyment can be identified as intrinsic motivation.

Both these forms of motivation identify motivation as a product and process (Arora & Sharma, 2018). Motivation is thus an end product leading to optimal performance learning, and a process of achieving it (Arora & Sharma, 2018; Craig, 2018). Table 3 shows the different process questions of motivation defining the process method of ARCS.

- **Attention:** The element of attention answers the process question of making the learning experience interesting and stimulating. Attention deals with capturing or attracting a learner's interest, piquing and stimulating curiosity, inquiry, and then sustaining it (Keller, 2010). It includes three dimensions of perception arousal, inquiry arousal, and variability. Perception arousal is identified as curiosity generated by stimuli. Any change or sudden deviation from the routine learning environment can spark perceptual arousal. For instance, starting the course with a humorous story, a dramatic case study is a deviation from the norm, and can attract learners (Craig, 2018). Inquiry arousal comprises of ways to seek and sustain learner attention to continue knowledge-seeking behavior (Keller, 2010). Problems and discussion questions can be identified as inquiry arousal as such activities prompt learners to enquire, seek, discover, and explore knowledge (Fritea & Opre, 2015). The final dimension of variability revolves around the activity and behavior of sustaining learner curiosity and interest at all times (Keller, 2010). Variability is attained by presenting different stimuli with similar content to leaners i.e. through print or lectures, videos and podcasts.
- **Relevance:** The element of relevance is defined as 'those things which we perceive as instrumental in meeting the needs and satisfying the personal desires, including the accomplishment of personal goals (Keller, 1987:3). Relevance can be described as the connection between the subject matter to be taught and the learner's need to find the subject matter personally meaningful and relevant (Keller, 2010; Craig, 2018). The construct of relevance has three dimensions answering

*Table 3. ARCS Model, (Arora & Sharma,2018)*

| Element | Dimension | Process Question |
|---|---|---|
| Attention | • Perceptual Arousal<br>• Inquiry Arousal<br>• Variability | How can I make this learning experience interesting and stimulating? |
| Relevance | • Goal Orientation<br>• Motive Matching<br>• Familiarity | In what ways, will this learning experience be valuable for my students? |
| Confidence | • Learning Requirements<br>• Success Opportunities<br>• Personal Control | How can I, through instruction, help and support my students to succeed and control their success? |
| Satisfaction | • Natural Consequences<br>• Positive Consequences<br>• Equity | What can I do to make my students feel good about their learning experience, and desire to continue their learning? |

Table 3 shows how each element is classified into components and guided by process questions. Appropriate responses to the process questions ensure development of an appropriate learning design (Arora & Sharma, 2018).

the process question of making the learning experience valuable to the student (Arora & Sharma, 2018). The first dimension of goal orientation refers relating instruction to a learner's past/ present, or even future experiences. Instructors use various ways to connect subject matter to real-life examples to make students understand value of the content (Fritea & Opre, 2015). The dimension of motive matching means understanding a learner's motive, background, learning style, and matching him/her with a similar motivated instructor (Craig, 2018). The third dimension of familiarity refers to establishing a bridge between varied learners and the content (Keller, 1987). Familiarity is establishing closeness and relating the subject matter to a learner's beliefs, values, interests, and hobbies. A learner should be able to find some closeness and familiarity between his/ her beliefs and the content. The achievement of all three dimensions enables the learner to comprehend the value and relevance of the content to his/ her life (Arora & Sharma, 2018).

- **Confidence:** The confidence element is defined as 'helping the learners believe/ feel they will succeed and control their success' (Keller, 1987:2). Confidence relates to how students are able to control their learning environments, scaffold each other and themselves, and believe in their own ability/ competency to learn and solve problems (Craig, 2018). The dimension of learning opportunities means setting clear expectations and charting the roles of students and teachers before starting the teaching and learning process. Knowing the requirements forges a rapport and establishes boundaries and expectations increasing learner confidence (Craig, 2018). The dimension of creating success opportunities refers to constant practice through various means of solved and poorly solved examples (Keller, 2010). Students should be provided opportunities to explore, discuss, develop individual schemas and become confident with their abilities. The last dimension of personal control relates to feedback, connection, and isolation that can build or destroy learner confidence (Craig, 2018). Personal control dimension is a balance between learner autonomy, learner centered orientation, and learner isolation and separation between learner, classmates, and instructor (Fritea & Opre, 2015). The three dimensions combine to foster and boost learner confidence in the content and their ability to master it (Keller, 2010).
- **Satisfaction:** The construct of satisfaction is about creating authentic learning environments to provide learners with opportunities to develop and hone their abilities to achieve KSA mastery

(Keller, 1987, 2010). The description is more attuned to achieving intrinsic motivation and feeling a sense of pleasure on mastery of KSA (Firat et al., 2018). Satisfaction is temporary when external motivation is involved. For instance, a student might achieve satisfaction on completing the degree program, but this satisfaction is temporary when the student encounters real-life challenges (Firat et al., 2018). Inability to transfer KSA to workplace or real-life and solve problems/ challenges, decreases satisfaction. However, mastery of KSA brings about pure satisfaction (Firat et al., 2018; Craig, 2018).

All four constructs of attention, relevance, confidence, and satisfaction must be achieved to bring about optimal learning performance. Lack or failure of even one construct could impact learner performance and productivity (Craig, 2018). The framework of implementing ARCS in course and design depends on many factors such as conducting a comprehensive learner-needs analysis. The analysis ensures the development of constructs of attention and relevance (Arora & Sharma, 2018). Learner needs analysis shapes course design and structure by providing information about motives, goals, background, culture, beliefs, and values of learners (Keller, 2010). On completion of the need's analysis, the process of design and development begins with brainstorming and collaboration. Teaching methods, instructional aids, and tactics are developed. If being used, technology is integrated with instruction. Technology refers to technological learning objects, SNT and/ or LMS platforms (Schindler et al. 2017). Referring back to the TTF model, technology and task have to function together to effect optimal learner performance and productivity. In the next section, you will learn more about the challenge of task and technology dysfunction.

## MAIN FOCUS OF STUDY

The research study, conducted at a large public north-eastern higher educational research institution, forms part of an individual educational technology project undertaken by the author individually. The objective and purpose of the research project was to investigate Twitter usage by graduate students in a course. Twitter was used as an appropriate SNT as it led to increased student engagement, critical thinking, and an attitude of inquiry and discovery through constant interaction, and dialogue. It was also believed that Twitter developed a sense of comfort and security among reticent students and encouraged sharing of views and opinions A qualitative case study design with methods of observation, and interviews with the students and faculty was used. Case study methodology is deemed feasible to study real-life phenomenon in an in-depth manner (Creswell & Creswell, 2017). The author used the case study methodology to study the contemporary real-life phenomenon of Twitter usage in higher education. Research questions included usage, purpose, Twitter interaction, and perception of Twitter including content of tweets. In-depth analysis and discussion of results was done to identify and explain the limitation of the two theoretical frameworks discussed in the previous section i.e. TAM and ARCS. Data was analyzed using methods of coding and thematic analysis.

In Fall 2017, 32 students of the graduate class in Mass Media Law volunteered to participate in the research project for extra credit. The course ran for eight weeks. Initially, students had not been exposed to Twitter as one of the educational technology tools used in class. However, Twitter was used as an external link in Week 3 of the class. All 32 students had to use Twitter and participate actively to pass the course. Out of the 32 students in the class, 11 students already had a Twitter account. To earn extra credit for the class, 21 students created Twitter accounts. Data was collected on five counts on number of tweets, students who tweeted in general, students who tweeted specifically to class topics i.e. discussion topics with class hashtags (#), and perception of Twitter by each student. Twitter perception ranged from prior Twitter knowledge and experience to educational value of Twitter. Table 4 below lists results of the data collection.

Initial data collection was followed by interviews supplemented by field notes. The following themes emerged:

## Twitter Frequency

Out of the 32 participants, 30 students tweeted on a regular basis of at least five to six tweets in an hour every day. Among the 30 participants, ten students who had old Twitter accounts tweeted four times in the day when compared to other Twitter users. The tweets were to Twitter 'friends' whom the student had friended online on Twitter. New twitter users, 21 tweeted on various issues more than three times in a day. These new users had created Twitter accounts to initiate, participate, and friend people whom they did not know on a personal level. For instance, a new user admitted she likes to log onto Twitter not just for class 'stuff' but to 'know what is happening out there.' Most of the participants tweeted to be informed and stay current on all kinds of activities.

## Twitter Prior Knowledge

Table 4 shows 15 students had prior Twitter knowledge. This means these 15 participants knew how to download the app. the rules of Twitter, how to follow and tweet. Out of the 15, 11 had old Twitter accounts before the class, while four participants created new Twitter accounts. Only one participant out of the 11 participants with old Twitter accounts created a new Twitter account for class purposes, while the remaining ten participants used their old Twitter accounts for class. The remaining 17 participants who had created new Twitter accounts for the class; 12 participants said they knew Twitter as a social app. and had some idea as to how to download the app. link and communicate in Twitter.

## Twitter Function Usage/ Purpose

The function and purpose of Twitter was not limited to class topics. Students tweeted on issues of social, cultural, general informational topics. Out of 32 participants, 21 students followed a social celebrity, 15 tweeted about social happenings such as latest fashion trends and restaurants. 15 students retweeted a

*Table 4. Twitter Usage (Author, 2017)*

| Class | Previously had Twitter account | Created Twitter Account | Prior Twitter Knowledge | Twitter Educational Value |
|---|---|---|---|---|
| Mass Media Law | 11 | 21 | 15 | 10 |

high-profile story of a latest event or celebrity. 20 students used Twitter to just read and post comments on class discussion, while five students used Twitter to participate in class activities and discussions and tweeted under a class hashtag. Many students used Twitter to enhance their social profile, friend people online, and organize their friend lists. 14 students changed their Twitter profile picture to attract comments and friend people. Some participants i.e. 10 students used the advanced features of polling to play games on Twitter with classmates; 2 students followed their favorite celebrity; while 14 students used their cell phones to read general informational stories of events. Table 5 shows 10 students viewed Twitter to have educational value and impact. One participant said Twitter allowed him to exchange ideas on various subject issues. He claimed Twitter was a medium and space for communicating, collaborating with each other and instructor to think critically, and engage in content analysis and synthesis.

## Content of Tweets

A total of 710 tweets were logged from the daily activities of the 32 participants.

Table 5 above shows the tweets were a mix of class-related and non-class related items. Tagged class tweets accounted for a total of 309 out of 710 tweets. These tweets always began with the query, *'what's happening?'* A detailed analysis of the kinds of class tweets revealed 200 of these tweets were one-word, emoji's, and symbols These tweets dealt with status upgrades on class assignments, profile updates regarding location, mood, health, and/ or opinions about personal likes and dislikes. The remaining 109 tagged class tweets followed and participated in class discussions with explanations, examples and further reference sources adding to the class discussion about an issue.

A small number of participants tweeted and followed each other i.e. 18. These tweets were of a personal nature, relevant only to the individual tweeted and not to the entire class. Tagged informational tweets were mainly in the form of a reference link to a website or newspaper story followed by personal opinions. Such informational tweets related primarily to film, music, technology, and the weather. Tagged status tweets to other members of the online Twitter community accounted for 183 tweets. Participants tweeted their current status online to ensure other Twitter members knew what was happening in their life. One participant commented that tweeting about current status ensured people knew when to friend, or follow her on Twitter. Only 74 tagged tweets were social in nature, primarily about celebrities, fashion and re-posts regarding events, galas, and festivals.

## Twitter Interactions

Twitter interactions seemed to increase when there was a current news or social event happening. Interaction ranged from one-word tweets and emoji's to personal comments and thoughts. One participant described his interaction on Twitter as *'communication on a personal level....'* This same participant stated that Twitter allowed him to talk, share personal views and thoughts without class restrictions. In

*Table 5. Content of Tweets (Author, 2017)*

| Course | Total number of Tweets | Tweets with class hashtag (#) | Tweets to individual classmates (@) | Informational tweets with hashtag | Status tweets with hashtag | Social tweets with hashtag |
|---|---|---|---|---|---|---|
| Mass Media Law | 710 | 309 | 18 | 88 | 183 | 74 |

contrast, many participants who tweeted in tagged class discussions (refer to Table 6) said Twitter gave them the opportunity to engage in open dialogue with other classmates and the instructor. Other participants said Twitter afforded them the autonomy to follow celebrities and tweet, re-tweet stories. At the end of the semester, all tweets were graded and added to the final examination score. This was done as individual Twitter grades would have resulted in a failing grade for more half the class.

## Issues and Controversies

### Integration with Course Structure

Twitter began to be as used an information-sharing, communication, and collaboration tool from week three of the eight-week class. Course structure, rules, and policies had already been established when Twitter was introduced as an educational technology tool. This late integration with course and structure minimized the potential educational value and relevance of Twitter. The course instructor reported the failure to integrate Twitter from the beginning of the course as a regular communication and collaboration feature minimizes its effect on overall class performance. Most of the students did not accord Twitter importance and value. They viewed it as a social app meant for exchanging general information and not subject content. The instructor said students would have treated and used Twitter as an academic learning tool if it had been introduced during the introductory week, as one of the many features to be used and graded for course. Twitter could have been implemented as a regular weekly feature from week one, and could have garnered meaningful communication, collaboration, discussion, and individual schema development. The number of students who identified Twitter to have educational value would have increased.

### Twitter Purpose/ Objective

It became evident, Twitter had a significant purpose of information-sharing, communication, collaboration, individual research, and quick, timely student feedback. Twitter allowed students to think for themselves, explore their beliefs, and provided opportunities for instructor mentoring to guide students on to the right path. But all this was possible if Twitter's purpose and objective in the course was clearly established and communicated to students from the start of the course. As seen from Table 5, students did not understand the purpose, value, and relevance of using Twitter in the class. Students used it for general informational, social purposes. More than 20 students used Twitter to follow a celebrity or tweet on a social event. Failure to inform students during the introductory week about using Twitter as a way to discuss and share, exchange information and ideas only about class content impacted usability and purpose of Twitter. Further, 10 students used old Twitter accounts for class purposes. This adversely impacted the relevance and importance of Twitter as a class aid.

### Student Engagement

Table 5 demonstrates even though there were 309 tagged class tweets; only 109 tweets were relevant to class content. This shows that only a small percentage of the entire class was truly engaged with the content. Further, only 18 participants tweeted each other. These figures reveal that Twitter did not foster any kind of student engagement other than passive. Participants did not engage in collaborative, intense, or independent student engagement. Responses included one-word tweets and emojis which shows participants did not take responsibility and ownership of content. Participants did tweet on informational and social issues but such tweets did not pertain to class content. Participants merely read information and assimilated content. They did not engage with the content on any behavioral, cognitive, and/ or emotional dimension. Such participants have been previously identified as being passive student learners (Leach, 2016).

### Confidence and Satisfaction

Case results clearly show the course did not foster confidence and satisfaction among all 32 members of the class. The fact that only 109 students participated in meaningful interactions on Twitter shows lack of goal setting. This means more half the class had no idea as to the purpose and goal of Twitter. The app was being used to follow celebrities, read news stories and not for class content and discussion. Thus, the faculty and/ or curriculum developer failed to create learning opportunities and beliefs in self-efficacy. Failure to introduce and develop Twitter as a communication and learning space from the beginning relates directly to goal-setting, student self-efficacy, and learner control. It also raises a query about transference of KSA. Students did not have the opportunity to experiment and grow with Twitter as the course progressed. Twitter was introduced in week 3 and students were expected to tweet regularly about class content. The apparent failure to inform students about rules, purpose, and objective of Twitter had an adverse impact on the confidence and satisfaction factors of the course.

The above analysis clearly shows an apparent failure to appropriately integrate Twitter in course structure to establish purpose of using Twitter in class. Twitter does not seem to have had any positive learning impact. The challenge, therefore, becomes not to implement Twitter in academic courses, but to seamlessly integrate it and other SNTs within academic curricula from the start of the class, to effect student engagement, and lifelong learning.

## SOLUTIONS & RECCOMONDATIONS

Motivation has been identified as a key factor of any course and/ or learning medium to initiate and sustain the actions and behaviors of learning to function efficiently and effectively in knowledge, technology, and a performance-oriented economy (Firat et al., 2018, Center for Post-Secondary Research, 2017). But the meaning and scope of motivation has evolved over the years and in contemporary educational environments to encompass course or task characteristics as well as learning medium characteristics. As previously discussed, the focus was to develop, foster, and sustain motivation levels in higher education (Schindler et al., 2017). The above case study shows effective student engagement and learning are the products of task and technology i.e. course and SNT.

SNT cannot be introduced as a whim to enhance the look and feel of a design. Integration of SNT into any course requires careful analysis, synthesis, and a theory. Let's go back to the theory of TTF that details how both task and technology characteristics impact learning and performance (Lai, 2017). Type of SNT to be used i.e. whether to use Twitter or Facebook, the manner in which SNT has to be used i.e. as a supplementary tool in the course sometimes or as a regular weekly feature within the course will determine the effectiveness of the entire course. Thus, the theory of TAM determines usage and acceptance of technology should be considered with the motivational instructional design theory of ARCS.

Designing instruction is a process- a determination and combination of learner and technology purposes (Craig, 2018). But the failure of using Twitter in the class as seen in the above case shows any kind of technology has to be meshed and blended with the course design to foster effective and efficient learning.

## The Case Study

The issue is why Twitter failed to bring about intense and independent student engagement at all three dimensions of cognitive, behavioral, and emotional. For effective learning and transfer of KSA which is a hallmark of ARCS, emotional connect or the presence of affect is paramount for a learner (Craig, 2018; Fritea & Opre, 2015). In the above case study, there seems to be no emotional connect among participants, with course content and faculty. As numbers show, only 109 tweets were course related, while 200 tweets were general in nature. This indicates a passive state of student engagement characterized by not asking questions, and having no interest in the class content. The process of asking questions means learners relate to class content, are thinking critically, analyzing and synthesizing content to effect schema development and accommodation for future transfer of KSA (Craig, 2018).

Further, the inability to gauge whether all 32 students would be able to use Twitter regularly could be viewed as another deterrent in the path to effective learning. To be able to use a technology effectively, regularly, and purposefully, it has to easily available and accessible (Hennessy et al., 2016). In the case study, only 11 students had prior Twitter accounts and 21 students had to create an account in week 3. This entire procedure indicates lack of foresight and organization. It can also be viewed as failure to investigate learner technology needs and perceived usage. Going back to our TAM analysis, it is evident learners perceived use (PU) and perceived ease of use (PEU) determines the level of usage by a person (Wingo et al., 2017). This shows the faculty and/ or curriculum developer should have conducted learner-technology needs analysis before introducing and using Twitter in class. Participants also had the autonomy to use their old Twitter accounts for class purposes. On one level, this seems understandable to foster and promote feeling of self-control among learners. This may hint at developing collaborative and intense student engagement levels. But on another level, it can be viewed as undermining the seriousness and purposefulness of using Twitter in class.

This brings us to the issue of explaining roles and the purpose for using Twitter. All participants were using Twitter for a good grade. This is evident from Table 5—only 109 were tagged class tweets. Most of the class did not understand the function and purpose of using Twitter in class other than getting a good grade. This strongly indicates the overwhelming presence of external motivation. It is the faculty and curriculum designer's role and responsibility to explain the internal motivation of using Twitter. Further, failure to introduce Twitter as a learning medium in the course can also be seen as an impediment to effective learning. As discussed in our analysis above, not introducing Twitter at the beginning of the class to clarify rules, goals, and expectations of Twitter can adversely impact use of Twitter. The dimension of variability also comes into question. There could have been room to use Twitter in alternating and bi-weekly fashion employing the factor of variability ensuring learner attention at all times during the class. But introduction of Twitter in week 3 as a weekly regular feature in the course may have caused disinterest and lack of stimulation for the learner. Twitter usage can be relegated to a matter of routine causing a dip in learner emotional connect and attention.

## The ARCS Design Process

The ARCS design framework is not a static design of combining course information with learner needs analysis to identify performance/ learning gaps, establish outcomes and goals to develop appropriate instruction for efficient, effective learning (Craig, 2018; Pradia, 2016). The ARCS design framework is a systematic design process incorporating learners' needs in terms of socio-economic background, culture, belief, and value systems to determine instructional pedagogies, aids, and learning objects (Craig, 2018). Table 6 lists the ten design steps supporting each other to effect path and direction of learning.

The first three stages of obtaining course information, LNA, determining appropriate ID model and learning theory, developing learner motivational profile can be identified as the foundational steps shaping the course direction and learning potential. The steps pertain to course and learner-needs analysis. It is at this stage the higher educational systems falter and fail to include educational technology analysis (ETA). Thus, stage 2 comprising of LNA must also include ETA. A designer should collect course

*Table 6. ARCS design steps (Balaban-Sali, 2008)*

| Stages | Steps | Meaning | Activity |
|---|---|---|---|
| 1 | Obtain course information | Course description, rationale, setting up delivery systems, and instructor information | Meeting with subject-matter-expert (SME), learning management systems (LMS), information technology professionals (IT) to gather course and LMS information |
| 2 | Obtain audience information | Entry skill levels, attitudes towards school or work, and attitudes towards course | Conducting learner needs analysis (LNA) through surveys, interviews, focus groups |
| 3 | Analyze audience | Motivational profile, root causes, modifiable influences | Compiling and evaluating learner needs to develop learner profiles for understanding, shaping instruction, determining instructional design (ID), and model learning theory |
| 4 | Analyze existing materials/ systems/ methods | Positive features, deficiencies or problems, and related issues | Meeting LMS coordinators, SMEs, faculty, other instructional and curriculum design and IT personnel |
| 5 | List objectives and assessments | Motivational design goals, learner goals, behaviors and outcomes | Drafting learner objectives (LO), performance objectives (PO), rough storyboard, and collaborative meeting with SME |
| 6 | List potential instructional strategies/ ideas | Brainstorm teaching, instructional ideas, and appropriate methods for course | Collaborative meeting with SME, discussions/ brainstorming, further developing storyboard This is a CONTINUOUS STEP- meeting with SME throughout development of course |
| 7 | Select and design tactics | Integration of tactics in course content | Meeting with SME, completing storyboard, written instructions |
| 8 | Select and develop instructional materials | Select materials appropriate and suitable for instruction, modify them if applicable, develop new instructional materials | Meeting with SME, other curriculum designers, IT/ LMS personnel, written instruction |
| 9 | Implementation phase | Develop the entire course with all aids and tactics, implement it for students | Run a final check, pilot course and check for minute errors, then go live |
| 10 | Evaluation and revision | Obtain student feedback, determine satisfaction level, revise | Conduct summative assessment surveys from students and faculty, compile results, determine if ARCS criteria are met, revise if necessary |

information, then conduct LNA including ETA, and then re-visit the first stage to modify course information and rules to include technology rules also. This should be followed by stage 3 to develop learner motivational profile. Curriculum design and consequent instruction will be lacking if learner technology needs, expectations are not considered. Case study analysis shows the lack of ETA did impact learning adversely. The technology of Twitter, student reactions to it was not considered. Consequently, usage of Twitter did not align with its academic purpose.

To compile a comprehensive learner motivational profile, learner perceived use (PU) and perceived ease of use (PEU) of the technology has to be done. LNA must include learner reaction, access and familiarity with the technology. Learner PEU must be investigated to understand and gauge frequency of usage of the technology for academic purpose. It is critical to study the perceived relevance of the technology for class from learner perspective. PEU studies the relevance, practical value and benefit a technology has for the learner. It analyses whether the use of the technology will enhance and help the learner to broaden his/ her schema. Inclusion of PU studies, individual, system, and social influences a technology (Lai, 2017). Thus, ETA studies in-depth how and when an individual is using the technology, familiarity with the technology i.e. do the learners use it, or are they only familiar with it. In the mass media ethics class, only 11 students already had Twitter accounts, while 21 had to create new accounts. This indicates a level of familiarity with the technology, and PU by the learner. Similarly, ETA will also investigate system, and/ or institutional characteristics providing support and enhance PU. Institutional characteristics indicate any means and methods developed and employed by the higher education institution to support usage, maintenance, and relevance of the technology. In the ethics class, institutional characteristics could have taken a logistical and supportive approach so opening new Twitter accounts by all 32 students solely for class purposes was done at the start of the semester. Further, institutional controls would have monitored and regularized Twitter frequency usage. This would have reduced the number of general, informational, and social tweets.

A comprehensive LNA including ETA will determine an appropriate ID model and learning theory suitable for the entire duration of a course. It is impossible to select a feasible ID model and learning theory if the learner motivational profile is incomplete at the start of the course. An instructional designer and/or curriculum developer needs to have a complete motivational profile including learner PEU, PU, socio-economic background, culture, values, beliefs, and expectations to be able to frame appropriate course design developed on a robust and suitable ID model and learning theory. A curriculum developer has to consider type of technology used to select and seamlessly integrate into the instruction at appropriate times. In the ethics class, knowledge about the learner interaction with Twitter would have helped and enhanced the course in terms of variability and confidence. The use of Twitter would have allowed faculty as well as the curriculum developer to select and develop a teaching method allowing for usage of Twitter. Instructional tactics and learning objects would have been developed keeping Twitter in mind. This would have increased the variability dimension of the attention construct of ARCS.

All 32 students were expected to use Twitter every week i.e. from week 3 till the end of the semester. This kind of regularity would have been perceived as routine and mundane by learners, and decreased chances of learner attention. There would have been no stimulation, and change in teaching pace and style. This sameness of instruction method would have had a negative impact on learning as seen in the case study above. Individual Twitter scores had to be combined with final exam scores to achieve a passing grade for every learner in the class. Change in teaching delivery and stimulation would have added variety and flexibility to the course. Further, the dimension of variability would have impacted intensity levels of the technology directly effecting learner stimulation. Learning objects and the manner of utilizing the technology would have varied stimulation pace and focus for the learners. In the mass media ethics class, learners could have used Twitter in a variety of ways such a debating space, a discussion online room, a reference or graphic visual site. The goal is to make learning fun and at the same time foster and encourage higher-order cognitive skills of critical thinking, analysis, and synthesis. Integrating technology such as SNT in class also impacts level of confidence of learners. Using Twitter in many different ways would develop self-efficacy, and a sense of self-control and responsibility towards the learning. Discussion and debate tweets along with individual and collaborative research tweets would enable learners to accommodate and assimilate content to develop holistic schema. This would generate an independent level of student engagement coupled with a high level of satisfaction indicating KSA mastery and transference. Table 7 below shows how the inclusion of technology in every phase of course design directly impacts motivation and student engagement.

The table shows the LNA and ETA help in development of a full learner motivational profile to shape the course scope. Consequent development and alignment of LO and PO enable ARCS foundation as elements of attention, relevance, confidence, and satisfaction are built into the course. Integrating Twitter from the beginning of the course in the case study would have ensured development and alignment of ARCS and led to high student engagement levels. The development of ARCS leading to collaborative, intense, and independent student engagement levels is a cyclical process. The solution lies in modifying the original TTF model to suit learner needs. A modified TTF model comprises of a cyclical process where task and course as well as technology characteristics are shaped by the ARCS and TAM theories respectively. Both these characteristics of task and technology combine and influence each other to impact student engagement and motivation levels. High positive levels of student engagement and motivation result in optimal productivity and performance learning. Passive student engagement and low motivation produce low and negative performance learning and productivity. The modified TTF model provides a sound SNT framework as it incorporates the seamless integration of technology in course or task development from the beginning. Seamless integration of task and technology is possible through a comprehensive ETA to effect positive student engagement and motivation leading to optimal learning.

## FUTURE RESEARCH DIRECTIONS

The chapter analysis and synthesis align with the contemporary dilemma of higher educational institutions using technology to develop effective student engagement and learning. But the above analysis seems to

*Table 7. Modified course design steps (Author, 2019)*

| | | | | |
|---|---|---|---|---|
| **Step 1** | Obtain audience information | LNA+ ETA | | |
| **Step 2** | Develop a motivational profile | Combine LNA and ETA, meeting with SME | Attention + Relevance | |
| **Step 3** | Obtain course information | Meet SME, develop course information based on LNA, ETA, existent course information | Attention + Relevance | |
| **Step 4** | Develop the course | Choose ID model, learning theory, write LO, PO, storyboard, instructional tactics, learning objects | Attention + Confidence + Satisfaction | Collaborative + Intense + Independent student engagement levels |

have a narrow perspective limited to traditional university students. It would be interesting and challenging to broaden and expand this research investigation to learner populations other than traditional college/ university learners in brick and mortar classrooms. Perhaps researchers need to study SNT potential and frequency in non-traditional learners (NAL). Another possibility could be employing a quantitative research methodology of using surveys and experiments to manipulate and control SNT usage frequency and meaning. Another research direction could be to study SNT usage among different regions within the USA. Maybe SNT usage and impact is different in regions other than the northeast where this case study was concentrated. Research scholars and practitioners could perhaps study differing perspectives, meanings, and theories impacting usage of SNT in the classroom. Cross-cultural research studies with both qualitative and quantitative methodologies with a longitudinal focus could also be done.

## CONCLUSION

The stated objective of developing a sound SNT framework for higher education to guide and enable administrators, faculty, and curriculum designers use SNT in an efficient and effective manner has been met. Implementation of the SNT framework will lead to a positive direct increase in learner motivation and student engagement. The author bases the SNT framework on three sections of (a) background or literature review, (b) main focus of chapter or the empirical case study, and (c) solutions and recommendation for developing the SNT framework. The first section comprising the literature review has four disparate sub-sections on a) student engagement, b) SNT, c) theoretical models of TTF, TAM, and ARCS. The detailed literature review serves as a critical foundation.

The second section of the 'main focus of chapter' describes, and analyses a qualitative case study. The case study focused on the use of a SNT i.e. Twitter usage in a graduate class at a north-eastern U.S university. The case study analysis shapes the synthesis of the third section i.e. solutions and recommendations. In the third section, the author synthesizes relevant literature review, and case analysis to develop a SNT framework for higher education. In the remaining two sections, the author discusses potential future research directions, and a conclusion.

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## KEY TERMS AND DEFINITIONS

**Digital Native:** Identified as people who are early adopters or who are adept at using technology because of easy access to technology.

**Facebook:** A social utility or tool helping people communicate effectively and efficiently with their friends, family, and colleagues.

**Instructional Design:** Process by which learning products and experiences are designed, developed, and delivered.

**Learning Management System (LMS):** Defined as software application for the administration, documentation, tracking, reporting and delivery of educational courses, training programs, or learning and development programs

**Online Social Network Tools (SNT):** Virtual, online social tools, such as Twitter, MySpace, Facebook, and Instant Messaging, which are used by mainstream society and students to communicate with and remain, connected to their social networks.

**Tweets:** Electronic messages sent through a Twitter-enabled device or application containing no more than 140 characters.

**Twitter:** A real-time short messaging service working over multiple networks and devices.

**Web 2.0:** Online applications providing a social writing platform for collaborations among members in a group, or individuals who share common interests.

# Chapter 4
# Infusing the Science of Learning Into a Higher Education Leadership Seminar at a Public University: Improving Graduate Learning by Design

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## ABSTRACT

*This chapter explores how one graduate-level seminar incorporated technology and insights from the science of learning to improve the delivery and assessment of course content. Drawing on the case study, "Technology and Innovation in Higher Education," an elective seminar for master's and doctoral students taught at The University of Texas at Austin (2015-2017), the authors discuss the benefits of project-based learning, retrieval-based learning strategies, and the use of diverse teams in educational settings. The authors consider how technology was used in this blended-learning/hybrid course to more efficiently and effectively achieve the learning goals. The chapter concludes with practical recommendations for instructors who seek to incorporate insights from the science of learning in their graduate courses.*

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## INTRODUCTION

While the purported shortcomings of higher education have gained attention in the national media—critics citing the rising costs of college, stagnant graduation rates, and admissions scandals—many of higher education's positive achievements have failed to earn significant consideration. One such achievement that has not received due attention is that, across postsecondary institutions, instructional practices are improving; more course instructors are incorporating active learning methods than ever before (Schell & Butler, 2018), and cognitive science research about memory, attention, and cognition is guiding these instructional decisions (Miller, 2014). Compared to more passive forms of teaching such as lecture or examinations that evaluate rote memorization, active learning strategies (e.g., project-based learning, retrieval-enhanced learning) have been shown to produce considerable gains in student learning (Freeman et al., 2014; Singer, Nielsen, & Schweingruber, 2013). To indicate the scale of this achievement, a survey of more than 200 Engineering faculty members in the United States found that 98% of respondents were aware of at least one research-based pedagogy, with as many as 82% of them regularly incorporating such practices into their courses (Borrego, Cutler, Froyd, Prince, & Henderson, 2011).

At the same time that research-based instructional practices are on the rise in contemporary p-20 education, learning technologies have become ubiquitous to support student learning both in online courses and in traditional, face-to-face campus settings (Horn & Staker, 2015; Bonk & Graham, 2005). The growth of technology in contemporary education has been attributed to multiple causes, including an interest in reducing the cost of college, student demand for more flexible and personalized learning, an enhanced focus on assessment and documenting student learning gains, and the availability of technologies in the marketplace (Miller, 2014). A recent survey conducted by McGraw Hill (2017) underscores the value that college students place on educational technology; a majority of postsecondary students surveyed (94%) said that digital learning helped them retain new concepts, and 61% preferred to enroll in a course with digital learning technologies. From the perspective of students, technological elements positively enhance their learning. From the perspective of colleges and universities, there is a broadly held belief that "chalk doesn't cut it anymore."

In her book *Minds Online: Teaching Effectively with Technology*, Miller (2014) adopts the guiding premise that it is impossible to disentangle two overlapping trends: the growing interest in applying insights from cognitive psychology about how learning happens in the brain and the rapid proliferation of online education and instructional technology. While active learning, online, and other evidence-based pedagogies are on the rise, there remains considerable variation in the instructional strategies used and how they are administered (Miller, 2014; Schell & Butler, 2018). Amid these technological and other paradigmatic shifts in education, much can be learned by closely examining how instructors adapt core concepts from the science of learning to make informed choices about what, how, and when they are going to try out new things in their teaching. The purpose of this chapter is to examine how one graduate-level seminar meaningfully incorporated blended learning technologies, retrieval-based learning strategies (Brown, Roediger, & McDaniel, 2014), project-based learning (Krajcik & Blumfeld, 2006), and the use of diverse teams (Davidson, 2012) to provide a high-quality, transformative, and memorable educational experience for master's and doctoral students. Given that graduate courses prepare the future professoriate, the authors contend it is all the more critical that these courses foreground research-based instructional strategies and innovative technologies so that fledgling academics learn to incorporate these practices into their future classrooms.

Leveraging the multiple perspectives of the instructor, a teaching assistant (TA), and graduate students enrolled in the course, chapter authors reflect upon their experiences in the course. The initial section provides a brief description of the graduate course, its goals, and primary content. In part one, the authors review the benefits of retrieval-enhanced learning theory and examine how these principles, paired with the online platform Learning Catalytics, were used to promote behaviors shown to increase students' long-term knowledge retention. In part two, the authors consider the role of the Learning Management System (LMS) to challenge learners to go beyond their academic comfort zones through multimodal projects. In part three, the authors explain how the course incorporated teamwork and digital collaboration tools to promote a high level of trust and mutual accountability among students. The chapter concludes with a summary of student feedback in a pre- and post-survey, as well as practical recommendations for instructors who seek to incorporate insights from the science of learning and new technologies in their graduate courses.

## CASE STUDY: "TECHNOLOGY AND INNOVATION IN HIGHER EDUCATION"

The course "Technology and Innovation in Higher Education" was taught at The University of Texas at Austin (UTA) in the fall semesters of 2014, 2015, 2016, and 2018. UTA is a large, comprehensive, research-intensive, public flagship university in the Southern United States. While the course was open to graduate students across the University, most enrolled students were seeking degrees to prepare them to be college administrators and/or higher education researchers. The class enrolled approximately twenty master's and doctoral students and was taught by Dr. Julie Schell, Clinical Assistant Professor.

This course provides an ideal case study for analysis because it demonstrates how "boundaries are breaking down between strictly traditional, face-to-face classroom instruction and online instruction" (Miller, 2014, p. xiii). More precisely, this graduate seminar used a *blended learning* or *hybrid* course design that incorporated both technology-mediated instruction with face-to-face instruction (Bonk & Graham, 2005). The course met on campus weekly for three hours; students were also expected to access readings/videos and complete several online assignments outside of class (e.g., weekly discussion board posts, reading quizzes, and major projects).

### A Course Inspired by Advances from the Science of Learning

The content of the course focused on advancements from the fields of learning science and the changing role of technology in contemporary colleges and universities. Course readings included supplemental articles and books that supported the three course objectives named in the syllabus: (a) to understand how students learn, (b) to critically assess the state of contemporary higher education, and (c) to use the theory of disruptive innovation to describe and predict future changes in the field. Some assigned books included *Make it Stick: The Science of Successful Learning* (Brown, Roediger, & McDaniel, 2014), *Why Don't Students Like School?: A Cognitive Scientist Answers Questions About How the Mind Works and What It Means for the Classroom* (Willingham, 2010), and *Now You See It: How Technology and Brain Science Will Transform Schools and Businesses for the 21st Century* (Davidson, 2012). Given the focus of the course, it was a prime candidate to showcase innovative pedagogical practices in a blended learning environment. In this respect, the course aligned form and function—core concepts in learning science were taught *using* innovative research-based pedagogies and *assessed* using creative assignments and technological platforms.

## Technology-Enhanced Education

The relationship between pedagogical goals and instructional technologies can be complex. Miller (2014) has argued that contemporary instructional technologies, at their best, provide an: "unprecedented opportunity [...] to align our teaching with the way the mind works" (p. xii). Such tools can "amplify and expand the repertoire of techniques that effective teachers use to elicit the attention, effort, and engagement that are the basis for learning" (p. xii). However, learning technologies can be misused when they become a frivolous add-on or a frustrating distraction that does little to enhance learning or improve the course. Ensuring that the tail never wagged the dog, Dr. Schell described her course as "technology-enhanced education." Her pedagogical decisions always preceded the use of technologies—she never used "technology for technology's sake." The platform Learning Catalytics was used to promote retrieval practice for individual students and small groups. The Learning Management System (LMS) provided space for an online discussion board that allowed students to dialogue with their peers outside of weekly class meetings. The discussion board supported Dr. Schell's goal of supporting learning as a social activity—recognizing that some students, especially those who are more introverted by nature, prefer the chance to develop their responses in writing rather than in class discussion. When using these tools, Dr. Schell asked students to reflect upon themselves as both *learners* and *technological consumers* to develop practical insights to serve them in their careers in higher education leadership.

# PART ONE: RETRIEVAL-ENHANCED LEARNING STRATEGIES

In the science of learning, retrieval refers to the act of recalling information that is stored in long-term memory. One of the most established empirical findings in the science of learning literature is that knowledge is enhanced by retrieval (Brown, Roediger, & McDaniel, 2014; Miller, 2014; Roediger & Butler, 2011; Schell & Butler, 2018). Active retrieval is vital for enhancing learning as it "does not merely produce rote, transient learning; it produces meaningful, long-term learning" (Karpicke, 2012, p. 158). Research on retrieval-enhanced learning in the context of a classroom posits, "Retrieval is not a neutral assessment of the contents of one's mind, but the process of retrieval itself contributes to learning" (Karpicke & Grimaldi, 2012, p. 4). Learning scientists have established that calling information to mind is a more effective learning strategy than passively reviewing notes or rereading a text (Roediger & Butler, 2010). Repeated recall or retrieval of information improved students' long-term retention of new material better than other approaches. Roediger and Karpicke (2006b) found that students who took a single test that required retrieval retained 16% more of the new information than their peers who had only taken notes or reviewed them; students who engaged in this activity three times retained approximately 20% more content than the students who only studied their notes. The correlation between repeated test-taking and enhanced learning has been termed the "testing-effect" in learning science literature (Roediger & Butler, 2010, p. 20).

## Use of Retrieval in College Classrooms

There are a variety of activities that instructors can draw on to engage students in retrieval. Common examples of retrieval activities include quizzes, flashcards, one-minute papers, pre-class reading questions, student presentations, discussion groups, and more. Despite their proven effectiveness, few students or instructors use retrieval strategies as a primary method of study (Karpicke, Butler & Roediger, 2009). Researchers found that a majority of students preferred less effective study strategies, including rereading texts, underlining passages, reviewing notes, cramming, and rote memorization. While these study strategies can produce "an illusion of mastery," they often fail to provide a deeper foundation of understanding (Brown, Roediger & McDaniel, 2014, p. 15). While students with acute short-term memories may retain enough of the material to earn a passing score on an examination, these ineffectual approaches fall short by not preparing learners to apply or evaluate what they learned.

## Strategies to Increase Learning

In addition to retrieval practices that students can self-administer, instructors can incorporate several findings from neuroscience into their teaching to benefit students. The growing body of research on retrieval-enhanced study strategies has found that learning increases through the following five practices: (a) feedback, (b) repeated retrieval, (c) spaced practice, (d) interleaved and varied practice, and (e) elaboration. Many of these best practices can be facilitated through instructional technologies to deliver the maximum benefits for students (Miller, 2014).

## Feedback

Just as repeated testing can increase students' retention of new material, feedback after testing can also improve long-term learning. While retrieval is an effective studying technique even without feedback, providing the correct answer after a student has attempted the question can enhance learning by correcting any misunderstandings (Roediger & Butler, 2011). Slightly delayed feedback is even more effective; researchers posit that a brief time delay provides another opportunity for the student to call the information to mind.

*Repeated retrieval*, the continued and recurring practice of recalling material from memory rather than hearing or reading it, strengthens the memory and highlights knowledge gaps (Brown, Roediger & McDaniel, 2014). Repeated retrieval—facilitated by using flashcards, self-quizzing, or in-class activities—results in more learning than occasional or infrequent recall.

Temporally *spaced practice*—recalling information periodically in chronologically distinct study sessions—is more effective than cramming information into a single study session immediately before a test. Spacing out retrieval practice strengthens recall and interrupts the forgetting process. It is recommended that learners divide their studying into multiple, shorter sessions rather than a single event.

Just as learning is enhanced by frequent retrieval, *interleaved* and *varied practice* also improves long-term knowledge retention. *Interleaved practice* occurs when learners alternate between topics when studying—it is more beneficial for students to spend time retrieving information from multiple courses in a single study session rather than studying one subject per session. In *varied practice*, students answer more than one kind of question about the same material; this ensures that students go beyond memorization and recognize the deep structure of a concept in different contexts. Interleaved and varied practice more accurately model the real-world scenarios in which students must call to mind and use information. By engaging in varied and interleaved practice, learners often draw unexpected connections across subjects and increase the likelihood of committing the concepts to memory.

Finally, *elaboration* supports long-term learning by having learners express newly-acquired material in their own words or connecting it to previous knowledge. Elaboration encourages learners to apply concepts to situations outside the classroom—hereby engaging in knowledge transfer.

## Retrieval-Based Learning in the Graduate Classroom

Technology and Innovation utilized two structures for students to engage in retrieval-enhanced learning strategies: questionnaires about assigned readings (WarmUps) and in-class Peer Instruction quizzes (CO-LABs).

## Retrieval Activity Examples in Practice

The first course element that promoted students' engagement in retrieval-based learning was the weekly WarmUp. Conducted through the Learning Management System (LMS), WarmUps were short, low-stakes assignments consisting of three to five multiple choice questions and short answer questions to prompt students to recall key ideas, terms, and concepts. Table 1 includes a sample WarmUp.

While students were permitted to consult readings or notes to complete the WarmUp, the instructor's questions tested for a higher-order cognitive understanding of material, including inference and synthesis. Miller (2014) warned that, "left to their own devices, students may stray toward shallow processing," but instructors "can successfully redirect them with the right kinds of guidance" (p. 112). As in the sample question above, the instructor provided a novel example (not from the reading) and reworded the definition (not verbatim from the text); these strategies made it difficult to locate the answer in the text if a student had not read carefully. The WarmUp redirected students to go beyond memorization by applying a concept to an unfamiliar example.

The second course element that foregrounded students' retrieval practice was the CO-LAB, modeled on Mazur's (1990) Peer Instruction concept. Once students arrived in class, they sat in pre-assigned

*Table 1. Sample warm-up (abbreviated)*

| |
|---|
| **Question 1**<br>Annie studies and feels confident in her ability to grasp the material. When she reads over her notes, she immediately recognizes what she sees. She knows all the vocabulary she encounters. When she goes over all the highlighted portions of the textbook, nothing surprises her. She reads through her notes a few times before the class. Annie is probably:<br>a. confusing familiarity with mastery*<br>b. confusing retrieval with rehearsal<br>c. confusing massing with retrieving<br>d. confusing interleaving with spacing |
| **Question 2**<br>What did you find most confusing or difficult about what you read? |
| **Question 3**<br>What did you enjoy about what you read? |

*Correct Answer

teams to complete a CO-LAB, a "collaborative, retrieval practice activity," using Learning Catalytics, a subscription-based online platform (Syllabus, p. 8). The activity took approximately 45-minutes and consisted of two rounds of repeated retrieval. During the first round, each student individually answered ten to twelve multiple-choice questions on course concepts unaided by notes or text. In the second round, students worked with peers to repeat the quiz—ultimately, registering a single answer on the group's behalf. Each student received a grade that averaged the individual score with the team's score. By automatically recording and sharing scores with the instructor, Learning Catalytics made the grading more efficient for the instructor.

WarmUps and CO-LABs used technology to incorporate the five best practices of retrieval-enhanced education: repeated retrieval, spaced practice, interleaved and varied practice, elaboration, and feedback. Since the CO-LABs were "closed book," students relied only on their recall and understanding. The frequency of these weekly activities offered repeated retrieval opportunities to test and reinforce knowledge comprehension. All WarmUps and CO-LABs were cumulative; the format encouraged *spaced*, *varied*, and *interleaved* retrieval across the semester. The design of the course discouraged cramming—CO-LABs and WarmUps incorporated multiple concepts at a time, built upon concepts learned in previous weeks, and presented the material in different formats. The structure of these weekly quizzes also provided students with opportunities to practice elaboration through open-ended questions and peer discussion (in class and via the online discussion board). The open-ended questions in the WarmUps provided the opportunity for students to retrieve information, reflect on the reading, and *elaborate* by coming to their own conclusions (Crouch & Mazur, 2012; Schell & Butler, 2018). The second round of a CO-LAB presented another valuable *elaboration* opportunity. In this portion of the activity, students discussed concepts in their teams and weighed the rationale for selecting one answer over another; this action required students to put concepts into their own words and engage in repeated recall. This discourse helped students understand the material more deeply and identify gaps or misunderstandings in their knowledge. The instructor and the TA walked around the room to help guide any wildly inaccurate discussions, while not revealing any correct answers at this stage. This gentle *feedback* helped groups perform more effectively.

Students were always provided the correct answer and explanatory *feedback* after the end of the CO-LAB. A major advantage of the Learning Catalytics platform is that it provides an instructor with a real-time assessment of students' knowledge. With one glance at the results screen, the instructor can instantly pinpoint which (if any) questions a majority of students answered incorrectly. In Technology and Innovation, the instructor used this information to reteach underlying concepts that students failed to grasp. In a course where concepts build on each other, a misunderstanding early in the semester can have particularly detrimental repercussions. Rather than re-teach material that a majority of students already know, a nimble instructor can use a real-time assessment of students' learning to develop a targeted, on-the-spot lesson plan. A real-time assessment can reveal which students might be struggling and merit an intervention. Such patterns are more difficult to discern without a technological platform like Learning Catalytics.

An indirect benefit of frequent quizzing was that it provided students with ample motivation to read carefully to prepare for class (Karpicke & Grimaldi, 2012, p. 404). The inevitability of a graded quiz encouraged students to practice the new study strategies to learn the material deeply. Round two of the CO-LAB, where students re-answered the quiz questions in teams, provided an additional social incentive to come to class prepared so as not to let the team down or be the perceived weak link.

The literature on learning science has demonstrated that retrieving information from memory is critical to the learning process. Technology and Innovation used the course's Learning Management System and the Learning Cataltyics platform to maximize the impact of the testing effect wherein tests both assess *and* strengthen learning The instructor utilized frequent retrieval opportunities to increase the benefits to students. CO-LABs included questions about previous course modules, positioning students to space out their studying and incorporate material from previous weeks into their preparation. The instructor worded questions so that students would engage in interleaved practice, varied practice, and elaboration. Finally, feedback was given to each quiz question, often in multiple forms.

Instructors wishing to engage students in retrieval-enhanced learning are encouraged to select activities that align with the forms of thinking specific to their disciplines. For example, if teaching a communication class, an appropriate retrieval activity might be requiring students to give short, extemporaneous oral presentations on what they read. A mathematics instructor might use pop quizzes with unfamiliar problems to encourage students to conjure information from memory and prompt elaboration. To ensure that students retain information across the semester, a Biology instructor might begin each class with a short quiz administered using clickers so that students engaged in spaced practice. In each case, instructional technologies—including the Learning Management System and Learning Analytics—can be used to make these pedagogical activities more efficient and provide real-time assessment data to instructors.

## PART TWO: CHALLENGING ASSIGNMENTS TO PROMOTE KNOWLEDGE TRANSFER

When business executives and hiring managers were asked to identify the skills that were "very important" for college graduates, 87% identified the ability to "apply knowledge/skills to real-world settings" (Hart Research Associates, 2018, p. 12). Another governing principle for Technology and Innovation was "Experiential Learning and Authenticity," a belief that "true learning comes through doing"; the course foregrounded "experiential learning with strong social interaction and hands-on application" (Syllabus). Whereas other graduate courses might rely on passive forms of learning, including lecture and unstructured group discussions, this seminar facilitated knowledge transfer through project-based learning.

### Knowledge Transfer as an Indicator of Deep Learning

While WarmUps and CO-LABs encouraged students to enact study strategies shown to increase long-term retention of material, the major course assignments urged students apply what they learned to new and novel situations. In a book assigned for the course, *Why Don't Students Like School* (2010), neuroscientist Daniel Willingham argued that knowledge transfer, defined as the ability to "successfully apply old knowledge to a new problem" (p. 97), is the best measure of a student's deep understanding. Although knowledge transfer is a crucial determinant of advanced mastery, Willingham argued that students rarely achieve this outcome for two reasons. First, advanced cognitive processing is taxing—it takes considerably more mental energy and repeated exposure to problems to identify their underlying structure and apply principles to different situations. Second, teachers rarely challenge students to engage in elaboration or knowledge transfer. In the American p-20 educational system, students are most often asked to identify or define terms on tests and assignments; to succeed, students need engage only in lower-order cognitive processing or rote memorization. By the time students have arrived in graduate school, nearly all learners have been conditioned to demonstrate and measure their learning in these ways; most have acquired the skills to memorize concepts and ace standardized examinations. Graduate-level instructors face unique challenges, first to challenge advanced learners with appropriately complex material, and second, to develop assignments that encourage students to transfer their knowledge.

## Applying Project-Based Learning in Graduate Education

In Technology and Innovation, graduate learners were challenged to go beyond straightforward memorization and apply what they were learning in novel and unfamiliar ways. The instructor discussed the merits of students leaving the security of what she called their metaphoric "academic comfort zones." By completing experiential projects that demanded students to apply what they learned, students stood to master the content and to develop greater self-awareness of their learning processes. The instructor often reminded students of her overriding goal: for students to transfer their knowledge from the classroom to outside contexts, including in their professional careers.

Guided by Willingham's neuroscience research, assigned projects prompted students to transfer their learning in creative ways while also presenting an appropriately sophisticated challenge for graduate learners. Willingham argued that students demonstrate the highest levels of engagement when working on problems that are precisely calibrated to their abilities. Said plainly, when a task is too easy, students grow bored, but when the challenge is too hard, learners may get discouraged and quit. Striving to get the balance right, the instructor assigned projects that, in her words, achieved the "desirable level of difficulty." Multi-faceted projects engaged students in variety of cognitive tasks, ranging from low-order skills (e.g., remembering) to more cognitively demanding higher-order skills (e.g., analyzing, creating). The instructor must develop some flexibility in assignment parameters to meet the needs of diverse learners; in any course, some students will be more advanced than others. The next section of the chapter considers how the course instructor sought to individualize assignments while maintaining a standardized framework, thus achieving the "desirable level of difficulty" for all.

## Assessing Learning Through Projects Completed by Individuals

Project-based learning allows "students to investigate questions, propose hypotheses and explanations, discuss their ideas, challenge the ideas of others, and try out new ideas" (Krajcik & Blumfeld, 2006, p. 318). As a way to prompt students' knowledge transfer, the course included four multimodal projects, one at the end of each major unit. In particular, two assignments from the course—the "adoption" project and the "design a game" project—were precisely engineered to ensure that all students engaged in reflective, creative, and advanced knowledge transfer.

### The Adoption Project

The "adoption project" was the second major project of the course and challenged students to experience learning as an intellectual, emotional, and behavioral process. In the weeks leading up to the project, students read about behavioral change models and theories of how innovations are diffused throughout a culture. Several of these readings highlighted the central role that empathy plays in the design of new technologies (Battarbee et al., 2015). Since the course sought to prepare students to develop and implement innovative approaches in higher education, these readings included practical strategies to bring new approaches to scale. In her weekly lessons, Dr. Schell impressed upon students that new ideas, approaches, and ways of doing things fail in implementation; when designers fail to consider the needs of a user, their innovations to reach full potential.

In the "adoption project," students were asked to apply what they learned about successfully disseminating innovations to promote the use of retrieval practice. Earlier in the semester, these students had spent many weeks reading about the considerable benefits of retrieval practice; in CO-LABs and WarmUp exercises, students accurately identified the advantages of this approach to learning over less-effective study skills. But when asked, many students admitted that they had not altered how they prepared for this or other courses; many returned to familiar habits of re-reading their notes to memorize terms rather than engaging in self-testing. In many ways, this example perfectly illustrates the core tenet of behavioral change theory—even when presented with evidence that an innovation is advantageous, users may not be sufficiently motivated to change.

## Motivating Behavioral Changes

Given students' reluctance to use retrieval practice as a primary study strategy, the "adoption project" focused explicitly on the mental and emotional processes associated with behavioral change. Each student was instructed to "adopt" a new habit or behavior for several weeks. This assignment recognized the ubiquity of technology in students' lives—in how they study, socialize, and live; although the project did not explicitly require students to use technology, nearly all students chose a new technology or an app to fulfill the assignment. The range of new habits that students adopted was diverse. For instance, some students began a daily meditation practice aided by the mobile app Calm, others sought to curb their use of social media by installing an internet blocker, and others tried managing their time and attention using the Pomodoro Method. Students recorded their experiences—intellectual, behavioral, and emotional—in a journal. As part of the project, students wrote a reflective paper and prepared an in-class presentation about their personal "adoption" journey.

In their in-class presentations, students described their successes and challenges. For instance, for some, the selected habit proved too complex or cumbersome to integrate into their daily routines. Others discussed personal struggles to "unplug" from social media or electronic devices, coming to realize that their technological dependence was stronger than they had previously known. On an emotional level, students noted that when they were tired and under stress, remaining committed to behavior change was considerably harder; trying circumstances triggered bad habits, including procrastination, cutting corners, and reverting to the status quo.

## Benefits of the "Adoption Project"

The "adoption project" provided students with valuable insights they might have failed to grasp had they been tested on the attributes of behavior-change theory using traditional assessments (e.g., papers, quizzes). As a result of having a hands-on experience, students developed a deeper understanding of behavioral change theories. More than that, students increased their empathy for individuals who might be on the receiving end of an innovation they create—such users might cast aside their good intentions in moments of stress. Consistent with the course goal to help enrolled students become innovators capable of successfully disseminating new educational approaches, this project gave them first-hand, lived experience of what it feels like to change one's behavior.

### Incorporating Flexibility into an Assigned Project

By allowing students the ability to select a personally-relevant habit, the "adoption project" prompted high levels of student engagement. Much of this work was accomplished outside of class. In writing posts for the online class discussion board, students discussed their insights and shared strategies for successful behavior change. Students frequently checked in with their classmates to see how the "adoption" was proceeding, often offering friendly advice or encouragement. By inviting students to interact with a technology of their choosing, the assignment encouraged personal accountability and investment. Allowing each learner to choose the behavioral change, the instructor helped all students achieve Willingham's recommended "desirable level of difficulty." That is to say, more advanced students could amplify the challenge by tackling a significant or particularly daunting change, while less advanced students (or students under increased stress) could take on a comparatively modest goal.

Whereas the "adoption" project was completed independently, students were also assigned team projects. The next section explains how the course sought to strengthen students' collaboration skills while also challenging them to apply their knowledge by designing a game to promote learning.

## PART THREE: SUPPORTING LEARNING AS A SOCIAL ACTIVITY

Technology and Innovation embraced learning as a social, collaborative, and emotional process. By using a combination of technologically enhanced processes, face-to-face conversations, individual assignments, and team projects, the course provided learners a variety of ways to engage with assigned content while simultaneously developing their communication and teamwork skills. Davidson's (2011) principle of "collaboration by difference" was used in the formation of diverse groups. Davidson argued, "collaboration by difference respects and rewards different forms and levels of expertise, perspective, culture, age, ability, and insight, treating difference not as a deficit but as a point of distinction" (p. 100). Research across industries has demonstrated that heterogeneous groups consistently perform better than homogeneous ones (Page, 2007). Eighty-seven percent of prospective employers rated the "ability to work in teams" as a top skill that college graduates need to succeed in the contemporary global economy (Hart Research Associates, 2018). The ability to work with others has a special significance in higher education leadership, the professional field in which most students planned to pursue careers upon graduating. In the course syllabus, Dr. Schell wrote:

*In the real world of higher education, people work in teams. Look up a series of job postings in your area and you will see 'works well in a team' or 'collaboration' as a job requirement. Work performance is a combination of your own effort, the effort of people you depend on to do your job, and on how well you collaborate with diverse others.*

Students were paired with other students who thought and learned differently to derive the benefits of "collaboration by difference." To assess students' self-identified work styles and their opinions about learning mindsets (e.g., growth mindset vs. fixed mindset), the course instructor developed and administered an in-class baseline survey. Then, taking students' grades from initial assignments into account, Dr. Schell and the TA used the baseline survey results to group students into mixed-ability teams. Since the course was open to master's and doctoral students, teams included a mix of both. These three and four-person teams worked together for the entire semester, completing both CO-LABs and major course projects.

To help students strengthen their soft skills, the instructor explained how she wanted students to collaborate and support one another. Whereas some instructors might make a passing reference about the importance of teamwork, Dr. Schell identified explicit grading criteria for "work effort" in the course syllabus. These criteria guided students to complete group assignments in specific ways; students were evaluated on being prepared, being an active contributor, respecting other group members, and professionalism (Syllabus, p. 6). Students received explicit feedback from their instructor about their ability to meet these expectations.

## Assessing Learning Through Team Projects

The final project of the semester was framed as a "cumulative experience" that students would complete in their assigned mixed-ability teams, to "bring together everything you have learned this semester to design a powerful, innovative learning experience via a game" (Assignment Description). The project guidelines were conceived so that students could construct a physical (analog) game or a digital/video game. To prepare, students read several articles about the principles of game design and Davidson's (2011) book about the advantages of game-based learning. In educational contexts, the term "gamification" has been coined to refer to an approach to teaching that "pulls in elements of gaming […] with the goal of creating a more motivating and memorable learning experience" (Miller, 2014, p. 189). Students were tasked with developing a game that prospective learners would enjoy playing and teach them something.The project was divided into multiple components, thus helping groups meet interim deadlines and receive timely feedback. Teams were given time during class to collaborate and were also expected to work together outside of class.

## Design a Game Project

In the "design a game" project, teams were first tasked with developing a five-page proposal for their concept, identifying a target audience, writing a summary of the game, and describing a description of the physical pieces and design (e.g., board game, card game). At this early stage, teams produced a collaboratively-authored document. Building on what they had learned about their teammates throughout the semester, successful teams used their advanced understanding of each teammate's strengths and leveraged their relative abilities. This project also provided opportunities for teams to continue to learn about one another—for example, discovering that a teammate's previously unknown artistic talent would enhance the aesthetic qualities of the game's design. Along the way, teams inevitably had to work through moments of conflict or tension—be it personality conflicts, scheduling difficulties, or problematic elements of the game itself.

Teams designed games with several learning goals in mind. One team developed a Candyland™-like board game—intended to be played by members of the residential life staff—in which players could win by correctly answering questions about the University's housing policies. Another team designed a card game to familiarize players with the University's resources to support students' mental health; one player would read a scenario aloud and players would race to be the first to play the card identifying the correct resource (e.g., campus police, health center, call-in hotline). A third group designed a board game to teach college students about responsible alcohol consumption using a modified design of the game Chutes and Ladders™. Each of these examples demonstrates how games can be used to help prospective players master concepts with a valuable, real-world application in a higher education context.

After receiving instructor and peer feedback on their written proposal, groups developed their game concepts further by building an initial prototype that could be played by others. Teams were encouraged to keep the production quality low for these initial designs, anticipating future revisions (e.g., hand-drawn pencil drawings rather than full-color). During class, teams watched peers play their game—identifying aspects of the game that would merit additional refinement. Teams continued to work together outside of class to create the "beta version" of their game (Assignment Description). In the beta version, teams were expected to have clarified rules of the games that might have been confusing, adjusted the mechanics of the game to ensure that all players had a fair chance of winning, achieved a high level of aesthetic production, and succeeded in delivering content so that players retained new information.

On the last day of class, teams presented their completed games, a PowerPoint presentation, and a brief elevator pitch about the game's merits. By requiring a multi-modal project at the end of the course, teams were presented with a final opportunity to divide the tasks across members to ensure that all teammates made an appropriate contribution. Much like the "adoption" project, the "design a game" project demanded advanced knowledge transfer and creative problem-solving in teams. The majority of class time during the final meeting was left for students to play games created by other teams—this celebrated not only the achievements of each team but also the broader sense of camaraderie across all students.

## Technology, Collaboration, and Team Projects

By including team projects in a graduate seminar, course instructors can be reasonably assured that students will engage with a variety of technologies. In the "design a game" project, teams used platforms to support collaborative authorship, such as electronically sharing documents using "track changes" in Microsoft Word, writing together with shared GoogleDocs, or sharing files in Dropbox. Teams had to devote ample time to ensure that each team member understood how to use these tools.

The unique needs of graduate students—many of whom balance considerable professional and familial responsibilities—heightened the degree to which teams relied upon technology. To overcome scheduling problems, many groups scheduled virtual meetings outside of class using video conferencing software (e.g., Skype, Zoom). To be successful, not only did students have to successfully use these tools, but team members also had to develop norms and strategies to support their collaborations. For instance, team members had to communicate with one another to ensure that work was not duplicated and that tasks had not been overlooked. Teams had to maintain their progress in the face of inevitable setbacks, such as a teammate's illness, a technological snafu, or an unexpected schedule change. These added dimensions of a team project—the use of modern communication technologies and the skills to support open communication and participation—simulate the realities of the 21st-century workplace.

## Encouraging Reflection, Feedback, and Peer Assessment in Team-Based Learning

All students were required to submit a "Completion Sheet" with their final game that consisted of a few open-ended prompts and multiple-choice questions through the Learning Management System. This element of the project promoted reflection and feedback. Students were asked to self-assess their learning on a Likert scale for statements such as "I can explain the inherent learning experiences involved in games" and respond to open-ended prompts such as "My favorite part of this project was…" This information provided the instructor with students' perceptions of what learned from the assignment suggestions for how the project might be revised in future semesters.

## Evaluation of Self and Peers

The "Completion Sheet" required students to evaluate their contributions to the team and to evaluate the contributions of their peers. Guided by the evaluation criteria shared in the course syllabus (e.g., professionalism, respectfulness, preparedness), students issued numerical rating. By giving students clear guidelines about what was expected of them and holding them to these standards, Dr. Schell helped students gain both self-awareness and practical skills to succeed in the workplace. The "Completion Sheet" also included this open-ended prompt:

*Please support your ratings with qualitative comments. I will never share your feedback directly with a team member, if there are issues—I will ask you to tell me more. Make sure you reflect on your own contributions as well.*

Here students noted the strengths and deficiencies of their teammates. The instructor synthesized this feedback into themes, incorporated her observations, and included it as part of a student's overall grade. It was possible for students within the same group to receive a different final grade reflective of their contributions. If any peer ratings were outliers, Dr. Schell asked for more information. Individual or group interventions were also carried out as needed depending on the nature of the feedback.

Including an opportunity for reflection with project-based learning encouraged students' continuous improvement and growth in several ways. First, students gained empathy for their peers as they assessed each other's contributions. This helped students learn to deliver feedback in a constructive manner—one which ultimately served the team's continued growth rather than just the individual's grade. This reflective component also prompted students to consider how their work styles and personalities enabled (or hindered) others to be successful; for instance, a strong-willed leader might realize that their domineering nature prevented an introverted group member from participating fully. Knowing that this assessment was coming, students felt a sense of accountability to contribute to the group's workload and success. Second, this reflection and feedback process modeled a 360-degree performance review, wherein a supervisor and multiple colleagues might all weigh in on an individual's work performance. By providing students with anonymized feedback about their strengths and weaknesses, the review offered students insight into how to be a better professional colleague. Whereas many instructors assign group projects, the approach used in Technology and Innovation ensured that these projects provided authentic opportunities to work with diverse others while also receiving constructive feedback about how to become a better collaborator. A third benefit of the "Completion Sheet" is that helped the instructor understand how students were experiencing the course and identified aspects of her teaching that might merit revision in the future.

## CHANGES IN LEARNERS HABITS AND PERCEPTIONS

Students self-reported several changes to their study habits and attitudes about learning as a result of taking Technology and Innovation. In 2016 and 2018, the instructor administered a pre- and post-survey to students to examine their attitudes about learning, study habits, and perception of effective study skills. Student responses to three of the questions are summarized in Table 2.

In both 2016 and 2018, students' responses to Question 1 demonstrate that the course effectively identified the limitations of passive study strategies, such as "writing down information." The change was more dramatic in 2016 wherein 64.3% of students' reported changing their perception after the course; the change in 2018 was less significant, though fewer students (46.7%) previously believed that this to be an "extremely effective" or "very effective" study strategy.

Student responses to Question 2 demonstrated that knowing that a study strategy is beneficial may not be sufficient to motivate behavior change. In both 2016 and 2018, approximately 14% of students reported an increase in how frequently they used retrieval-based study strategies. One student (2018) elaborated by explaining,

*I try to use retrieval practice when I study, not only in this course, but in all of my courses this semester. However, it is still something that I have to make a conscious effort to do—it doesn't come naturally to me.*

This student's response indicates that it may be necessary to re-test students in the future to determine whether they change their approach to studying.

Student responses to Question 3—how frequently students engaged in serious reflection about their learning—revealed the greatest disparity across years. In 2016, 85.7% of students self-reported that they reflected "daily" or "2-3 times per week" after having taken the Technology and Innovation seminar. Whereas in 2018, only 13.3% of students reported this outcome. Possible explanations for the variation in student responses could be naturally-occurring differences in enrolled students' overall dispositions or actual changes resulting from significant course revisions.

*Table 2. Student responses in a pre- and post- test*

| | 2016 Section ($n$ = 14) | | | 2018 Section ($n$ = 16) | | |
|---|---|---|---|---|---|---|
| | Pre-Test | Post-Test | Change | Pre-Test | Post-Test | Change |
| Q1: Percentage of students who think that "writing down all the important information" is an "extremely effective" or "very effective" study strategy. | 85.7% | 21.4% | -64.3% | 46.7% | 20.0% | -26.7% |
| Q2: Percentage of students who "practice retrieving information from memory without looking at notes or other materials" either "2-3 times per week" or "daily." | 64.2% | 78.6% | 14.4% | 40.0% | 53.3% | 13.3% |
| Q3: Percentage of students who "engage in serious reflection of my learning" either "2-3 times per week" or "daily." | 42.9% | 85.7% | 42.8% | 0.0% | 13.3% | 13.3% |

The pre- and post-survey also included open-ended questions; analyzing students' responses reveals additional insights about their changing attitudes toward teamwork. When asked to comment on how the student changed as a result of taking the class, one student from 2016 wrote, "I think I relied on and appreciated working in groups because it scaffolded my learning effectively. I think I'll rely more on peer review/feedback and group work than I used to." Affirming students' perception of the positive impact of project-based learning and "collaboration by difference," another student (2016) wrote, "I learned how to work with others and to collaborate on a project." A student from 2018 wrote:

*I think the most important thing that I learned is the value of working with others. My teammates and I all had our own strengths and weaknesses, and I think we were able to learn how to work with others that think and act differently than you do.*

A different student from 2018 praised the "design a game" project for "help[ing] me to appreciate a collaborative experience as it ultimately ended up a better product with more brains than just my own." Structuring group projects with intentional goals and outcomes appears to have a significant impact for students' thinking about the value of collaboration.

Finally, when asked why they took the course, several students noted that the class has been recommended to them by another student in the graduate program. One student from 2016 went so far to note, "I heard that it was the most challenging yet most rewarding class I had the option of taking." A 2018 student commented, "I loved that this class allowed us to be creative, academic, and collaborative (all at the same time!). Also, learning can be a lot of fun." These comments from students demonstrate that the most challenging courses can also be the most rewarding and engaging.

## RECOMMENDATIONS FOR INSTRUCTORS

This chapter has demonstrated how one instructor successfully drew on the science of learning to incorporate active learning pedagogies and innovative educational technologies and structure them to enhance a graduate-level seminar. These practices included the use of retrieval-enhanced learning, project-based learning assignments that demanded creative problem-solving, and the intentional use of teamwork to promote learning as a social activity. It is natural that different instructors might select different technological tools or goals based on the norms of their discipline, the enrolled student population, and other factors (Miller, 2014). Guided by lessons learned during the design and teaching of Technology and Innovation, the authors offer six practical recommendations to instructors who seek to incorporate such practices into their college teaching.

### Conduct Course Audits to Identify Opportunities for the Science of Learning

The first recommendation is that instructors should take stock of their current course to identify where they might already be using the science of learning or innovative technologies as well as where there might be opportunities to do more. Before making any changes, instructors should first audit their current course structure, content, and assessments to determine whether and how each component supports the multiple goals of long-term knowledge retention, knowledge transfer, and effective collaboration. Any element of the course that fails to achieve these aims is a prime candidate for modification. Instructors are encouraged to bring students into this audit-and -revision process as design partners. Doing so will help instructors gain insights and empathy to their students' experiences and identify challenges they experienced as learners (e.g., complex topics they failed to grasp, projects that reinforced existing skills rather than enhancing new ones). In addition, instructors are advised to attempt a revision of one aspect of a course at a time rather than trying to transform an entire course at once; the time and effort demands of making such a transformation are significant. Across the years, Technology and Innovation had undergone significant revisions—and continues to be reimagined and revised to this day.

## Articulate Goals for Students' Learning

Second, it is vital that instructors who incorporate research-based instructional practices or new technologies into their courses articulate their motivations for doing so—both for themselves and their students. Incorporating these elements into class design takes considerable creativity, time, effort, and resources for both the instructor and the students (Halonen & Dunn, 2018). Such intensive demands can be justified by the considerable benefits accrued by a future generation of innovative professionals and educators. In Technology and Innovation, this rationale was particularly apt, as the course aimed to create self-regulated learners capable of designing solutions to some of the most vexing problems in higher education. As a result, the course emphasized the application of practical skills that would help students deepen their learning and develop the necessary skills to thrive in the 21st-century workplace. Other instructors might be motivated to pursue different (and equally worthy) goals and deliver their courses differently as a result. It is essential that instructors take the time to articulate why they seek to incorporate research-based instructional strategies or new technologies. Failing to do so will likely result in frustration wherein the instructor or the students cannot determine why they are investing additional time and effort.

## Engage in Collective Efforts to Improve Teaching

The third recommendation is that instructors who are committed to incorporating research-based instructional strategies in their courses should seek out support from others. Revising and teaching a course that includes insights from learning science is demanding—to ease these burdens, instructors are advised to spread the effort across many individuals. Dr. Schell worked alongside both a dedicated TA and former students to design and carry out the course. She assigned the TA primary responsibility to draft course assets, to upload approved content to the Learning Management System, to copy-edit assignments, to provide feedback from enrolled students, and to co-teach selected topics. While other instructors might assign their TAs more mundane or administrative tasks—such as grading tests or making photocopies—Dr. Schell envisioned the TA as an integral partner in improving student learning through feedback, observation, and partnership. At the same time, the TA benefitted by partnering with the instructor to engage in a more in-depth learning experience and gaining valuable experience applying research-based pedagogies. Different instructors might find it beneficial to work with an IT expert, a faculty colleague, or a thought partner in a campus Teaching and Learning Center to achieve the same outcome. Moreover, Dr. Schell also sought out the support of former students and professional colleagues who were well-versed and committed to using instructional practices such as retrieval-practice and project-based learning. She regularly invited former students and colleagues to attend the class to give informal guest lectures, especially on days when students were presenting projects. These individuals provided additional feedback to students beyond what she could provide as an instructor. By calling on other individuals, Dr. Schell improved the benefits for enrolled students and accomplished some of the more time-intensive tasks more efficiently.

## Anticipate and Plan for Student Resistance

The fourth recommendation is that instructors should anticipate and plan for student resistance, defined as "behaviors and actions that students take in a classroom situation in when they become frustrated, upset, or disengaged" or other behaviors that "limit the learning of students themselves and potentially other students around them" (Seidel & Tanner, 2017, p. 586-7). Achieving deep learning is inherently difficult because it exacts additional cognitive demands on learners' brains while also forcing them to discard some of the behaviors that have previously led to their academic success. Instructors are encouraged to address early indicators of student resistance before it derails morale or interferes with the experience of learners. To prevent resistance, instructors can follow Dr. Schell's example and be explicit about the pedagogical philosophy—in other words, to explain why the additional effort and discomfort associated with the new approach has value. Dr. Schell included two to three pages about her teaching philosophy in the course syllabus and reviewed this reasoning in depth during the first meeting of the course.

Additionally, by designing and sharing project and assignment rubrics, Dr. Schell aligned her expectations for students so that they could understand the criteria for their grade evaluation. Still, if student resistance surfaces, instructors can quantify the resistance and employ systems to gather student feedback about their course experiences (Seidel & Tanner, 2017). By collecting student feedback about what is working in the course and what is not, instructors will have more insight into learners' experiences. Instructors must create a plan for resistance management and how to use student feedback—including what (if any) changes are urgent enough to be implemented right away and which should be addressed in a future semester. Seeking out feedback conveys to students that the instructor cares about them and is responsive to their concerns.

## Incorporate Opportunities to Learn from Students

The fifth recommendation is that instructors who are committed to engineering their courses around advances in learning science should themselves embrace opportunities to learn and reflect alongside their students. By choosing to adopt these innovative pedagogical methods, instructors are presented with a potentially transformative learning experience. Just as students gained a wealth of insight through the "adoption" project, instructors also stand to gain an enhanced awareness of how they learn and cope with change when adopting new approaches. It is important that instructors embrace the mindset that pedagogical innovation is a learning experience and that sometimes failure is instructive. Gathering feedback from students about what is working well and what might be improved—either face-to-face or using electronic systems—can only further enhance learning about students. Dr. Schell earned impressively high scores on her formal course evaluations despite her assessment that elements of the class merited revision or rethinking. One conclusion to draw from this is that students appreciate and respect instructors who regularly ask for their feedback about what might be changed in the future—even if the results are not perfect. Students are likely to be understanding when things do not go according to plan, provided their instructor is open, transparent, and receptive to student feedback. Instructors are encouraged to take some risks and work through ambiguity with grace if things do not go as envisioned.

Learning and reflecting alongside students every semester is essential to continued implementation success. Moreover, having an open mind and a willingness to grow and change directly models the desired outcomes for students. At the same time, instructors should embrace an iterative design approach. Any experimental course is likely to undergo significant revisions each time it is repeated.

### Advocate for Institutional Change

The final recommendation is for faculty members to use the appropriate governance structures at their campus to advocate for institutional changes that prioritize student learning and the thoughtful use of new technologies. A recent essay in *The Chronicle of Higher Education* argued that while instructors are using active-learning and other "high-impact" instructional practices with greater frequency, many describe them as "exhausting," "labor-intensive," and rarely rewarded in merit or tenure and promotion processes (Halonen & Dunn, 2018). This signals that institutional structures, support, and recognition systems may be out of sync with advances in learning science. It is imperative that universities begin to revise policies and reward structures so that instructors are encouraged to design and deliver courses that promote learning. Failing to do so will result in costly missed opportunities in which students fail to retain key concepts from one course to the next, thus leading many instructors to spend additional time reviewing previously-taught concepts or students failing to pass more advanced courses. The actual cost may be even higher—a generation of college graduates unable to transfer their "book learning" to the dynamic of the modern workplace. On the one hand, the authors encourage faculty members to incorporate these strategies into their courses. On the other hand, the authors also believe that universities must offer incentives and support structures to make these modifications sustainable over time.

## CONCLUSION

In this chapter, the authors have demonstrated how insights from the science of learning could be facilitated through technology and effectively integrated into a graduate-level seminar at a large public university. In the course, students were prompted to use technologies that encouraged behaviors shown to result in long-term knowledge retention, including frequent retrieval. Course projects guided students towards applying course concepts to novel scenarios—

prompting them to engage in the all-important and under-practiced skill of knowledge transfer. By intentionally dividing students into heterogeneous groups and providing explicit feedback on their contributions to the team, the course helped learners hone the practical skills for a successful career in higher education leadership. As a result of having taken this course, students described acquiring a deep understanding of the assigned material, developed insights about the metacognitive dimensions of learning, and improved their study habits.

As argued throughout this chapter, there are an infinite number of ways to apply findings from the study of cognition and the science of learning into the college classroom. It is not expected that every instructor will integrate aforenamed research-based instructional strategies in the same manner as Dr. Schell, but it stands to reason that nearly all courses might be improved through the conscious and tailored inclusion of research-based pedagogical practices and technologies. Not only do these approaches enhance student learning and engagement, they can be used to help students to master the relevant skills for their future careers. Colleges and universities, Dr. Schell argued, *need people to solve problems where there is no clear path to the answer. Innovators must, under nearly every circumstance, be comfortable in an environment full of complexities, mixed signals, and unstructured avenues. (Syllabus, p. 4)*

By teaching tomorrow's professors and leaders to master relevant content and work more effectively with diverse others, graduate courses with technologically-enhanced, research-based instructional practices create self-regulated learners equipped with both the knowledge and skills to solve complex problems.

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# Chapter 5
# Individual Cognitive Differences and Student Engagement in Video Lectures and E-Learning Environments

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## ABSTRACT

*Student engagement is a research area which has been focused on for many years but gained growing interest especially in recent years. Studies in the literature indicate that there is an agreement on the relationship between learning outcomes and student engagement in school and classroom context. But, what is not yet clear is the impact of cognitive individual differences of learners on student engagement, especially when exposed to video lectures. Thus, this chapter focuses on understanding individual cognitive differences in order to improve student engagement. The rest of this chapter will be organized as follows: Firstly, student engagement is defined based on different engagement models with a special focus on video lectures. Secondly, previous research will be reviewed to discuss the relationship between student engagement and cognitive individual differences. This is followed by recommendations that can be used for further student engagement research.*



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## INTRODUCTION

The widespread use of information and communication technologies by learners and instructors in education has created a paradigm shift in educational contexts including learning environments, learner preferences, instructor behavior, and learning materials. The role of new technologies in education has initiated the use of new emerging pedagogical models, including e-learning. E-learning provides several benefits to all types of learners. In e-learning environments, greater learner diversity creates a wider variety of learner needs and preferences. Instructional designers should consider such learner variability through more personalized e-learning environments, enabling learners to obtain greater benefits from the learning materials (Kinshuk, Chang, Graf & Yang, 2010).

Videos can be a rich and powerful learning medium that are attractive to learners as well. According to the Cisco Visual Networking Index report, global internet video traffic will account for 82% of all internet traffic by 2022, up from 75% in 2017 (CISCO, 2019). Studies focusing on video learning materials have shown that learners have greater satisfaction (Sadik, 2016), learning performances (Giannakos, Jaccheri & Krogstie, 2016; Giannakos, Chorianopoulos & Chrisochoides, 2015), retention (Hung, Kinshuk, & Chen, 2018), and engagement (Deslauriers, Schelew, & Wieman, 2011) and better learner experiences (Kizilcec, Bailenson, & Gomez, 2015). The study of students' learning and engagement with video lectures is an emerging study area in the instructional technology literature.

Although student engagement has become a popular topic, it has not been studied thoroughly from the perspective of individual cognitive differences. In addition, the key issue of how to keep students engaged in learning plays a critical role in the effective learning design process. Therefore, the purpose of this chapter is to present reflections on the current empirical findings of student engagement studies in the context of video lectures and cognitive individual differences. First, student engagement will be defined based on different engagement models and student engagement in video use will be explained, considering related empirical findings. Second, the relationship between student engagement and cognitive-based individual differences will be discussed using previous studies. This will be followed by some recommendations and critical questions that could be used for further research into student engagement in video-based e-learning environments.

## STUDENT ENGAGEMENT

### Student Engagement Models

Engagement is one of the most widely overgeneralized and misused concepts in the field of learning and psychology (Azevedo, 2015). Student engagement aims for increased achievement, positive behaviors, and a sense of belonging for students so they continue to learning activities. Studies since the early 1990s exploring how student engagement could be increased indicate that engagement could be increased through the utilization of technology-supported designs (Kearsley & Shneiderman, 1998), particularly when creating personalized learning environments in e-learning.

Student engagement can be defined as the active involvement of students in a learning activity and any interaction with instructors, other students, or the learning content through the use of digital technology (Christenson, Reschly, & Wylie, 2012; Henrie, Halverson, & Graham, 2015). According to Skinner and Belmont (1993), engagement occurs when students are involved in learning activities with positive feelings.

In the literature, there are multiple representations of engagement, including student engagement, learner engagement, academic engagement, and school engagement (Reschly & Christenson, 2012). These various terms have conceptual and contextual differences. Henrie, Halverson, and Graham (2015) noted that student engagement is commonly referred to solely in academic learning whereas learner engagement is used to refer to learning both inside and outside formal academic environments. Jimerson, Campos, and Greif (2003) defined student participation as academic performance, class activities, social activities, interpersonal interaction and relationships, and participation in the school environment. The term "student engagement" was used in the Glossary of Education Reform (2016) to refer to "the degree of attention, curiosity, interest, optimism, and passion that students show when they are learning or being taught, which extends to the level of motivation they have to learn and progress in their education". Sinatra, Heddy, and Lombardi (2015) reported that there has been little agreement on a concrete definition of student engagement.

Student engagement is regarded as a multi-dimensional construct including distinct components. Different models exist in the literature regarding student engagement. As a well-known model, Fredricks, Blumenfeld, and Paris (2004) provide three engagement types: behavioral engagement, cognitive engagement, and emotional engagement. Behavioral engagement includes the observable behaviors necessary to academic performance, such as attention, involvement, and attendance. Cognitive engagement refers to investment and effort, which is required for understanding what is being taught. Emotional engagement includes the positive and negative feelings of students towards instructors, peers, and the school, which all affect their tendency to study (Fredricks, Blumenfeld, & Paris, 2004).

Considering a holistic view from the most specific to the broadest level, Skinner and Pitzer (2012) explained student engagement with a model grounded in self-determination theory. The engagement model was developed on four nested levels: (1) engagement with prosocial institutions, (2) engagement with school, (3) engagement in the classroom, and (4) engagement with learning activities. The first level, which focuses on youth development, refers to the involvement of children and youth in social institutions such as community organizations. Engagement with the school refers to the focus on the involvement of children and youth in school activities such as academics, sports, and music. The third level refers to engagement related to activities in the classroom. Outcomes of the third level engagement are promoting achievement and protection against failure. Engagement with learning activities refers to participation in learning activities and academic work in school and focuses on promoting the development of academic assets. According to Henrie, Halverson, and Graham (2015), the model of student engagement developed by Skinner and Pitzer (2012) is useful in identifying the purpose and scope of student engagement and to understand it from specific learning activities to institutional concerns.

Student engagement models can also be developed by measuring student engagement in technology-mediated learning experiences (Henrie, Halverson, & Graham, 2015). Sinatra, Heddy, and Lombardi (2015) described the dimensional perspective of engagement with four categories (behavioral, emotional, cognitive, and agentic) based on studies by Fredricks (2011) and Reeve and Tseng (2011). According to their operational definitions, behavioral engagement is the motivation of learners in participating through actions in their own learning process. Cognitive engagement refers to psychological investment based on cognitive effort expended during learning and academic tasks (Wehlage & Smith, 1992). Emotional engagement is related to emotional reactions to academic activities and motivational constructs such as perceptions of value related to school and interest. As a new concept, agentic engagement refers to the proactive contribution of students to the flow of instruction. Although these forms of engagement seem to be distinct from each other, both forms occur with other forms during academic tasks and learning (Sinatra, Heddy, & Lombardi, 2015).

Ramesh Goldwasser, Huang, Daume and Getoor (2014) developed a framework to model student engagement types as latent variables based on their behavioral cues in massive open online courses and analyzed students' online behavior to identify how they engage with course materials. Using Probabilistic Soft Logic Modeling, they classified student engagement into three categories: active engagement, passive engagement, and disengagement. Active engagement means that the students are actively engaged in the course by participating in social activities. Passive engagement occurs when students regularly follow the learning materials but do not have an active presence in discussion activities, while disengagement occurs when learners cease actively or passively engaging with the course (Ramesh et al., 2014).

Various student engagement models have been developed to try to understand how students engage in learning in and outside of the academic environment. These models have been used to explain all aspects of learning including interaction, learning situations, academic performance, and student learning process in multiple perspectives (Azevedo, 2015). It is noteworthy to mention that the various student engagement models can be differentiated based on their perspective about two important factors: (1) the relation among individual differences of learners, contextual situations, and learning design and (2) the resources in the learning environment. In this chapter, we focus on the relation between student engagement and video lectures as a learning resource. We use the term "student engagement" as a broad concept including student involvement in meaningful learning activities (Kuh, 2003).

## Video Lectures and Engagement

Advances in technology have made videos more accessible and thus made video lectures one of the most important learning and teaching resources (Scagnoli, Choo, & Tian, 2019). The fact that videos enable audio and video interaction and combine multiple multimedia elements make them superior to other learning resources. Studies show a trend towards video use among students and video use has been critical in the effective learning of students (Bryson & Hand, 2007; Poquet, Lim, Mirriahi, & Dawson, 2018). This trend has led to the emergence of new generation of video-based learning environments and current pedagogical frameworks based on video usage (Flipped Classroom, MOOCs, etc.). The widespread use of videos and video-based environment create questions about how engagement occurs in learning with videos and how engagement is affected by video use. In this context, the relation between video use and student engagement has been studied by many researchers in the last decade.

Investigating the effect of video use on student engagement is a continuing concern within the field of video-based learning. In a quasi-experimental pre-post-test design study, Trenholm et al. (2018) investigated mathematics learners' cognitive engagement with recorded lecture videos. Learners were evaluated using the learning approaches scales near the course start and finish in the UK and Australia. The findings indicated a negative correlation between the number of times a learner viewed a video lecture and the final course grades of learners for regular users. It was concluded that a reduction in cognitive engagement on video lectures is associated with an increase in surface approaches to learning. Lin et al. (2017) examined student engagement with 78 online videos in a blended introductory mechanics course. They found that the participants were more engaged with lab-specific videos rather than lecture-oriented videos. The results suggest that the participants engaged with videos consisting of concrete information based on their perceived value for effective learning. In another study, McGowan and Hanna (2015) investigated how video lecture capture affects student engagement in a Java programming course. The student engagement was defined as behavioral viewing patterns of students including the timing of views, the frequency of views, and length of views in the study. The findings indicated that the students engaged with videos related to the assessment tasks more frequently in the initial weeks. The study highlighted the importance of analytics of viewing to understand the relationship between learning with video and student engagement. In their survey study in South Korea, Costley and Lange (2017) concluded that the number of video lectures viewed and media diversity has a positive effect on engagement, learning, satisfaction, and interest of students in the e-learning context. A study conducted with 965 students taking courses from Massive Open Online Course environments aimed to determine the factors affecting student engagement (Hew, 2018). The results revealed that five factors could increase student engagement in video-based learning environments: problem-centric learning with clear expositions, instructor accessibility and passion, active learning, peer interaction, and using helpful course resources. Another study by Pons, Walker, Hollis, and Thomas (2013) investigated the evaluation of student engagement with a lecture capture system. The results of the study showed that the lecture capture system enhances student engagement in courses. Scagnoli, Choo, and Tian (2019) investigated video lectures and its relationship to students' perceptions of learning. They found that video lectures can enhance a feeling of engagement with content due to control of the media and instructors' presence.

The issue of how student engagement occurs in the video-based learning environment has received critical attention in the literature of multimedia design and learning. For example, Gilardi, Holroyd, Newbury, and Watten (2015) investigated whether video lecture delivery formats had an effect on student engagement. In this experimental pilot study, a total of 50 participants were exposed to five different lecture delivery formats (screen-cast, enhanced screencast, in-person lecture, lecture theatre recording, and a video lecture delivery format in development at the University of Sussex) delivered by the same person and presenting the same amount of information. The results indicated that there was a relation between the video lecture delivery format and perceived engagement. They suggest that more studies related to design issues are needed to improve student engagement in massive open online courses. In another study, Costley, Hughes, and Lange (2017) examined whether there is a significant relationship between instructional design used in the courses and student engagement with online video lectures. The results showed that a major portion of students enrolled in online courses watched video lectures frequently and that the key elements of instructional design correlated positively with engagement within video lectures.

Research about video lectures indicate that providing videos alone does not guarantee effective student engagement. The results of the studies indicate that novel instructional design approaches and design features are needed to explore extent to which they affect student engagements in video lectures.

## Individual Differences and Engagement

A considerable amount of literature has been published on student engagement. These studies indicated that student engagement is associated with the individual differences of learners. Individual differences play a critical role during the instructional design processes and experts should consider learners' variabilities in order to create an effective design. With the extended usage of online learning, the paradigm of "one design for all learners" has changed to a "multiple designs for all learners" approach (Altun, 2012). Therefore, instructional design is a very important component in understanding the engagement of students. In addition to the demographic characteristics of students such as age and socio-economic level, cognitive-based individual differences (such as, memory, attention, language, etc.) are also very important for planning the design process. Thus, attention, working memory, and orientation will be contextualized and discussed in the following section in relation to the instructional design process.

## Attention and Engagement

The existing literature on attention theories outlines six different types of attention: selective, sustained, spatial, focused, shifting, and divided. Attention has been at the focus of research in investigations of the effects of different types of attention on learning, recall, retention, and memory performances in e-learning environments (Driver, 2001; Schweizer, 2010).

There various definitions of engagement in the literature differ from each other but all place a clear emphasis of on attention. Bluemink and Jarvela (2004) defined engagement as continuous attention in order to get and interpret information. Cocea and Weibelzahl (2011) also defined engagement constructs such as interest, effort, the focus of attention, and motivation. From these definitions, it can be seen that attention and engagement constructs are highly related to each other. Leiker et al. (2016) explained engagement using an example about games: people can be motivated to play a game, but if users get distracted, they may not be engaged. Effective instructional designs are necessary for keeping people engaged with the content or in a system, especially in e-learning environments.

With effective instructional designs, interaction and rich media can provide learners with more interaction opportunities and support learner engagement through responding to individual needs. Zhang, Zhou, Briggs, and Nunamaker (2006) stated that interactive videos help learners pay full attention to the content through active interaction between learners and instructional videos. In comparison to traditional classroom learning and individualized learning, it can increase the attention, involvement, and subsequent learning through interactive elements.

Therefore, attention guidance is important to guide and maintain attention during the instructional design process. Salience effects are techniques using visual cues that can direct learners' attention in multimedia environments. The human visual system actively seeks the interesting aspects of images, texts, or screens to reduce the effort needed to search for information during tasks. The inclusion of visual cues, such as non-content information such as pointers, arrows, lines, shading or colouring effects, can be used. In addition to these types of static cues, animated versions can also be used.

de Koning, Tabbers, Rikers, and Paas (2010) examined the direct effects of cues in a complex animation and focused on how visual spotlight-cues influence attention allocation and cognitive processing when learning from a complex instructional animation. They analyzed eye movements and found that learners looked more often and for longer periods of time at cued than at non-cued content in a cardiovascular system animation.

In another study, Lin and Atkinson (2011) explored the effects of using animation, visual cueing, and a combination of both in a multimedia learning environment that aims to support learners' acquisition and retention of scientific concepts and processes. They produced a static graphic and an animated version of the same content, each used with visual cues and no visual cues. Their results found no significant effect of visual cueing on learning outcome measures. Significant differences were found in learning time and that when studying in a visually cued environment, learners spent less time and learned more efficiently than the peers studying non-cued instructional materials. In addition, learners in cued-static graphic condition spent less time than their peers in a non-cued static condition. These results indicate that the use of visual cues can enhance learning by reducing learning time and learners' search activity.

Köseoğlu, Mazman, Altun, and Efendioğlu (2013) focused on learners' prior content experience differentiation in terms of behaviors and recall performances in graphically animated design and in a verbal contextual cue design. In the graphically animated content, neural transmissions were animated with no verbal clues. In the verbal contextual cue design, the animation was accompanied by narrated texts serving as verbal cues. The study results showed a significant difference between verbalized cue design and graphically animated design. Participants focused more on the graphical animated design than the verbal contextual cue design, which has been explained to be a result of split attention principle of multimedia learning principles (Mayer, 2009). In the 2013 study environment, information was presented in the same modalities (animation of graphics and textual cues with oral narration) in the verbal contextual cue design. For this reason, it is possible that participants' attention was interrupted by the introduction of those cues, causing a split attention effect and an eventual negative effect on the learning process.

More specifically, Ilgaz, Altun, and Aşkar (2014) studied sustained attention and the contextual cueing effect in e-learning environments and explored how two the different cue types (dynamic and static) used in e-learning environments affected the implicit memory performances of university students with different sustained attention levels. Their findings showed that the implicit memory performances of students with high or low sustained attention level did not differ based on the cue types. The static cue type was more effective for students with low sustained attention level than the dynamic cue type.

Chen, Wang, and Yu (2017) focused on sustained attention with the aim of developing a novel attention aware system capable of recognizing students' attention levels based on electroencephalography (EEG) signals in video lectures. The proposed system identified the periods in which students displayed a low level of attention when engaging in a learning activity with a video lecture. These kinds of systems can help in the detection of decreased attention levels during a learning task and provide insights for instructional designers.

Effective learning is highly related to the individual's capacity to sustain high levels of engagement and attention during the learning process. The current research has mainly focused on design effects, not different types of attention and more research is needed distinct design features for each of these attention types.

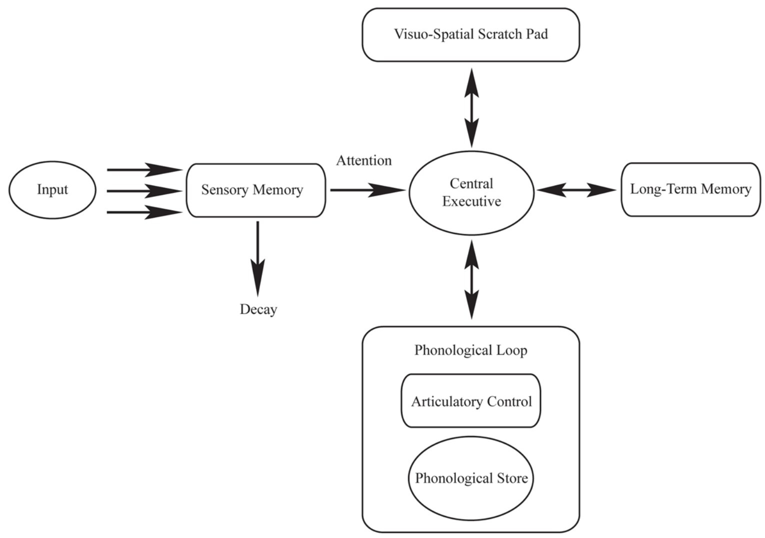
## Working Memory and Engagement

Another construct for personalized learning environment is working memory. Working memory is more related to cognitive processing such as holding information and allowing it to be used to perform a wide range of cognitive tasks, including transfer into, and retrieval from long-term memory (Baddeley, 2006). The working memory model consists of an episodic buffer, the central executive, the phonological loop, and the visuospatial sketchpad (see Figure 1).

Working memory has been at the focus of both cognitive load studies (Kirschner, Sweller, Kirschner, & Zambrano, 2018) and cognitive task performance studies (Cevik & Altun, 2016; Kirschner, Paas, & Kirschner, 2011). As the center of cognitive load theory and instructional design, working memory is an important component for engagement.

New information is regulated and controlled by the central executive. Auditory and visual information is processed by the phonological loop and visuospatial sketchpad and the episodic buffer organizes information in time, providing chronological information. Within this whole process, working memory has a limited capacity (Baddeley, 2000) and thus effective usage of these sources can shape and/or alter the information process. When information is processed in working memory, learning occurs by creating new schemas, integrating new information into existing schemas, combining lower level schemas with higher level schemas, creating more complex schemas, and changing and adapting schemas due to contradictory new and existing information (Van Merriënboer & Kirschner, 2007).

Figure 1. The Working Memory Model Components (Baddeley & Hitch, 1974)




Learner engagement happens when learners can be active in their own learning process, and as a result, improve their learning (Paas, Renkl & Sweller, 2003). Due to the limited capacity of their working memory, learners can either engage or become lost depending on the effectiveness of instructional design in e-learning environments. For example, Lusk et al. (2009) examined the effects of segmented and non-segmented multimedia instruction on learner recall performances at different working memory levels and found that segmentation of multimedia instruction has positive effects on recall and application knowledge acquisition. Another important finding was that the learners with low working memory capacity perform better in a segmented instruction setting. Segmentation provides learners with control of their learning process by stopping or continuing the information flow rather than a fully controlled mechanism (Mayer, 2009). In contrast, Florax and Ploetzner (2010) found no significant differences in learning performance in different segmented texts.

Mutlu Bayraktar and Altun (2012) focused on memory performances with attention processes. They created two different learning environments based on attention types (split vs. focused) and analyzed the recall performances of learners with different short-term memory capacities. The results of the study showed that the learners performed better in focused attention design regardless of their levels of short-term memory capacity and that short-term memory capacity had an effect on the time spent in studying learning material.

In another study, Cevik and Altun (2016) explored the effects of working memory performances and instructional strategies on learners' complex cognitive task performance in online environments. They developed an online learning environment made up of four levels: information only, information + demonstration, information + demonstration + application, and task-centered. Participants were grouped based on their working memory capacities and no significant differences based on complex cognitive tasks across instructional strategies were found. However, learners with a high working memory capacity performed significantly better on complex cognitive tasks than those with low working memory capacities.

## Orientation and Engagement

In addition to attention and working memory constructs, orientation is important for cognitive performance in terms of navigational behaviors. Spatial orientation determines the ability to navigate from place to place, identify an object moving towards us, estimate quantities, understand drawings and charts, and compose various items (Patkin & Dayan, 2013). The level of spatial orientation ability can influence learners' solution patterns, navigation behaviors, and system usage. Navigation can be a challenging task for hypertext readers in e-learning environments, where users have to allocate their cognitive resources to meet the cognitive demands and often become disoriented when navigating through hyperlinks (Altun, 2016).

Amadieu, Tricot, and Mariné (2009) investigated the effects of learners' prior knowledge in a non-linear e-document and analyzed the effects of this environment on disorientation and cognitive load. Learners were grouped as having high or low prior knowledge and assigned in two different environments (hierarchical vs. network structure). The results showed that low prior knowledge learners performed better in the hierarchical structure and were also less disoriented. In parallel, learners with a high level of prior knowledge performed better in the network structure. Similar findings were reported by Amadieu, van Gog, Paas, Tricot and Mariné (2009) who analyzed prior knowledge and orientation behaviors in an eye movement study. Learners who had low prior knowledge encountered higher disorientation when working with the network structured concept map than the hierarchically structured maps.

Ruttun and Macredie (2012) focused on disorientation from a different point of view by controlling instructional visual aids. The study's main aim was to examine the effects of cognitive style, domain knowledge, and computer experience on disorientation. They further explored the participants' learning performance and attitudes in a hypermedia learning system with and without visual navigational aids and with a set of visual cues. Results showed that the design with no visual aids had significant effects on disorientation, learning performance, and attitudes in the hypermedia learning system. However, no such effects were found for the visual aided version.

Mazman and Altun (2013) examined spatial orientation ability during a problem-solving process and recorded eye movements to analyze the differences between low and high spatial orientation ability groups. It was found that the high and low-level spatial orientation level groups solved problems with different solution patterns. According to the eye movement data, there were significant differences between the spatial orientation ability levels in terms of fixation duration. Another study by Altun and Mazman (2015) explored the measurement of programming performances by taking into consideration spatial orientation skills, working memory, perceived programming self-efficacy, mathematics scores, and academic grades. They found a relationship between visual-spatial memory and spatial orientation skills in the low-performance group. In contrast, spatial orientation, visual-spatial memory, and mental rotation performances were significantly different from each other and from the other three variables in the high-performance group.

# CONCLUSION

The academic sector accounted for over 50% of the global e-learning share in 2018 and e-learning is expected to reach USD 300 billion by 2025 (Bhutani & Bhardwaj, 2019). This significant growth will result in more people choosing e-learning modalities for academic and continuing learning experiences.

Furthermore, this growth will be accompanied by greater diversity in needs, aims, usage behaviours, and learning patterns. In such a context, instructional designers must consider individual differences to design more effective instructional environments and expose learners to more engaging learning experiences. E-learning experiences can be enriched by better design implications, adaptive systems, and user modelling (Santos, Kravcik, & Boticario, 2016). The aim of this chapter was to place the related components of student engagement and instructional design choices within the context of individual cognitive differences. Among a wide range of variables, this chapter focused on attention, working memory, and orientation from an instructional design perspective.

Designing a personalized or adaptive learning system is a difficult task despite new technologies and tools. Knowledge of users' needs and specifications is a fundamental step for effective design. This chapter aimed to present an overview of three cognitive differences that could be taken into account during the design process. According to analysts, video content will constitute 80% of global internet traffic in 2019 alone. Even if this is dominated by entertainment or commercial videos, the prevalence of online learning has also increased (Unger, 2018). Popularity of massive open online courses and webinars in particular will sustain the importance of video contents.

Related studies suggest that video lectures should be designed to increase student engagement using production elements such as delivery formats, presentation style, number of visuals, location of video, text, facial expressions of the instructor, speaking rate, and video length. Guo, Kim, and Rubin (2014) indicated that shorter videos (less than six minutes) and talking head or khan-style tutorials seem to be more engaging than other types. According to Hansch et al. (2015), designers should consider some affordances of video lectures such as manipulating time and space, demonstrations, visual juxtaposition, and multimedia presentation. More studies exploring the relationship between elements of video design and student engagement are needed. In future studies, video interaction data and students' affective states may be used to measure student engagement and to further explore engagement indicators. Further studies regarding student profiling based on engagement indicators would also be worthwhile.

The current literature generally examines attention through the lens of cueing techniques. Instructional designers are able to attract students' attention to a particular information in a video using the cueing technique. In terms of working memory, videos should be shorter instead of presenting a whole unit of information at once. Presenting information in small chunks can contribute to the effective use of working memory and dismiss individual differences that might otherwise occur. Another cognitive difference is orientation, which is related to navigation behaviours and user preferences may have an effect on their navigational choices as well. Especially in interactive videos, disorientation can be a problematic issue for students. Hierarchical or networked structure can be preferable if design is based on users' preferences and prior knowledge. These three components are highly related with each other, making it difficult to investigate them separately.

Last but not least, various learning design questions have emerged on how different cognitive characteristics might affect student engagement when exposed to various learning resources and video lectures in particular. Such inquiries would be significant for designing adaptive and/or personalized learning resources, especially when considering learners' cognitive performances. However, design suggestions for different types of attention, working memory capacity, and orientation can also provide insightful information to guide the development of personalized instructional design models that increase user content interaction and, hence, their engagement. It is important to present designs that are customized with the help of big data that can predict the cognitive characteristics of the users from their usage behaviours.

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## KEY TERMS AND DEFINITIONS

**Cognitive Differences:** The differences between cognitive traits like memory, attention, orientation.

**Student Engagement:** Students' active participation and effort in learning activities.

**Video Lectures:** A video recording of a lecture, teaching and learning activity.

# Chapter 6
# Using Video-Enhanced Performance Feedback for Student and Instructor Reflection and Evaluation

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## ABSTRACT

*Reflection is an essential component of experiential learning. Traditional means of reflection rely on memory of experiences, which can be incomplete or even faulty. Video-enhanced performance feedback (VPF)—the use of video to as supporting evidence in the reflective process—has the potential to transform reflective practice. In this chapter, the authors describe how VPF has been utilized by 13 instructors across two higher education institutions for the purposes of noticing, self-reflection, and evaluation/feedback. Results of an exploratory case study on perceptions of using VPF to support reflection indicate approximately 90% of students found Vosaic, the technology used at these institutions for VPF, easy to use and helpful to notice strengths and areas for improvement in their professional practice. Implications and considerations for incorporating VPF across disciplines are also addressed.*

## INTRODUCTION

Programs in higher education aim to equip their students with a vast array of skills that are readily transferable and applicable in real-world settings. Higher education faculty tasked with teaching these skills must also be able to accurately evaluate the degree to which students can proficiently execute skills within specific courses, as well as throughout students' program of study. While the goal of facilitat-

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ing students' application of field- or task-specific behaviors is widely seen as essential, the approaches instructors use to accomplish these critical learning outcomes can vary widely. Certainly, practice is a central element instructors leverage to ensure students acquire important skills, but learners also require ample and robust opportunities to reflect on their own practice, as well as the practice of others (Bandura, 1989), in order to develop nuanced understandings and an ability to execute critical skills.

When matched with effective pedagogy (Fullan, 2011), recent advances in video annotation software hold promise for transforming feedback, reflection, and evaluation in higher education classrooms (Rock et al., 2016). Video annotation technology can be utilized to increase learner engagement when observing, evaluating, and reflecting on performance-based learning outcomes. The authors refer to this type of engagement with technology as video-enhanced performance feedback (VPF). This term overlaps with a range of similar terms used throughout the literature (e.g., video reflection, video debrief, video-assisted assessment, video analysis). Some of these related terms have different meanings across fields, so VPF is used here to clarify the manner in which video is used for student engagement throughout this chapter. At the authors' institutions, students engage in VPF using a web-based tool called Vosaic (https://vosaic.com). Within special education teacher preparation courses (the authors' instructional context), VPF is used for four primary purposes: (a) to help students notice and evaluate others' use of specific practices, (b) to promote student reflection on their own execution of specific practices, (c) to provide specific feedback for student evaluation, and (d) to support instructor self-evaluation.

## REFLECTION FOR LEARNING

Reflection is undoubtedly a powerful mechanism for learning. It is a central component of *Experiential Learning*, which recognizes the importance of both experience and deliberate thinking about our experiences (Kolb, 2015). Dewey (1933, 1938), commonly viewed as a founder of progressive education, emphasizes the importance of reflective thought for learning and refers to reflective experience as both the *means* and the *goal* of education. For learners in higher education, understanding how to facilitate experiential learning is of particular consequence because many programs incorporate practicum experiences as part of their course sequences. Inherent in these experiential components is the assumption that learners will improve their abilities through repeated opportunities to apply essential knowledge and skills. The importance of reflection within this improvement process, however, cannot be overstated. DiStefano, Gino, Pisano, and Staats (2014) found providing an opportunity to engage in deliberate effort to identify and reflect on key lessons from an experience is more important to learning (i.e., a change in how one approaches the same task later) than repeated experiences without that opportunity. In other words, reflection is an essential part of the learning process for clinical or applied experiences; without this critical component, experiential opportunities risk falling short of impacting learners' future performance. Further, because novices may not reliably know how to focus their attention or interpret what they notice when they engage in reflection, it is essential to build common frameworks and shared language to help novices develop reflective skills (Benedict-Chambers, 2016). While reflection has long been regarded as an essential means by which to promote learning, the extent to which we structure and facilitate such reflections can have a strong impact on the ways learners respond to, and grow from, experiential learning.

## TECHNOLOGY AS TRANSFORMATIVE

Video, like any technology, can transform practice, but it can also be used as a substitute for existing practice without substantially changing, or improving, reflective practice. The National Education Technology Plan (U.S. Department of Education, Office of Educational Technology, 2017) challenges educators across the academic landscape to reimagine the role of technology to advance teaching and learning. If educators are to heed the call to transform their practice, however, it is critical that technology be adopted in a thoughtful manner that enhances existing evidence-based approaches (Rock et al., 2016), and educators must resist the temptation to adopt new technologies based primarily on the fact that they are new, and available (Cuban, 1993; Fullan, 2011). Various frameworks exist to guide educators' perspectives and decisions related to technology integration. Chief among these frameworks are the technological pedagogical and content knowledge (TPACK) framework, and the substitution, augmentation, modification, and redefinition (SAMR) model (Mishra & Koehler, 2006; Puentedura, 2006). The TPACK framework articulates important distinctions between educators' content knowledge, pedagogical knowledge, and technological knowledge, and helps teachers understand the complex interplay between these different knowledge domains. As teachers consider leveraging new technology tools in their teaching, the TPACK framework can assist them in exploring, for example, the extent to which the features of a particular technology tool align with the content they are trying to convey, or how the tool might impact the pedagogical approaches they choose to employ in the lesson.

In another guiding framework, the SAMR model posits four levels of learning, with the lower tiers, substitution and augmentation, representing ways to enhance learning through technology, and with the top tiers, modification and redefinition, indicating transformative approaches to technology integration (Puentedura, 2006). Substitution, for example, could involve substituting one basic word processing system (e.g., MS Word) with another of roughly equal capabilities (e.g., OpenOffice). The goal of the SAMR model, however, is to encourage technology integration in a more transformational way, represented by the higher levels of the model. The highest level, redefinition, describes technology adoption that fundamentally transforms learning experience in a way that would not be possible without technology. In order to maximize student learning, instructors must embrace these complexities inherent to technology as they engage in thoughtful deliberations related to its integration. Frameworks like TPACK and SAMR can help educators navigate this process, and assist them in implementing technology in ways that can enhance and transform their instruction.

## VIDEO TO ENHANCE REFLECTION

As higher education programs incorporate more practical experiences into their course sequences, student learning outcomes have become increasingly skill-based, and therefore require additional means of instruction and assessment beyond traditional lectures and tests. Across an array of disciplines, instructors have increasingly turned to VPF as a means of developing and evaluating those performance-based skills. Although this shift is promising, it should be cautioned that the mere introduction of these tools into teaching and evaluation does not guarantee any particular enhancement or improvement in student learning. Rather, and as noted above, optimal instruction and supports must be embedded alongside learners' use of video technology in order to achieve transformational learning experiences.

While reflection can clearly be accomplished without the use of video technology aids, learners who must rely on memory alone as they ponder and articulate their reflections must grapple with recollections that can often be faulty or incomplete. Memory inaccuracies, therefore, present a serious obstacle to anchored and in-depth reflection, which generally relies on one's ability to (a) notice specific behaviors or events, (b) comment on, and critique, observed behaviors to demonstrate depth of understanding, and (c) formulate plans for the refinement of those behaviors to improve future practice. Despite some learners' ability to accurately recall specific events or moments from a previous experience, episodic memories may fade as the length of time between the experience and the reflection increases. Thus, video offers an important reference point with which learners can engage as they reflect on their own performance; it also provides a stable representation of the experience that remains accessible to them well after the event has transpired. Perhaps unsurprisingly, researchers have found when video is used to support reflection, learners improve their ability to notice important details in observation (Star & Strickland, 2008).

By incorporating VPF into higher education clinical or practicum experiences, the reflective process can be functionally transformed for students and instructors alike. Using VPF to support reflection offers users unique advantages over reflection that relies on memory alone. First, VPF promotes engagement by allowing users to notice important instances or behaviors that occur during an event; in the context of self-reflection, having video as a reference allows all observers the opportunity to ensure their reflections are tied to accurate portrayals of events as they actually occurred. Additionally, while reflection is often enacted in a holistic or general way, and without clear connections made to specific events during an observation, self-reflection without supporting video evidence risks being overly broad, rendering it less valuable both for accurately describing and evaluating current performance, as well as in informing future practice.

As a result of the meaningful affordances offered by VPF, an array of fields currently employ this use of technology to build and hone performance during training or professional development experiences. Sports teams have long relied on VPF of athlete performance (e.g., Wilson, 2008; Wright, Atkins, & Jones, 2012) as a means of understanding game strategy, and making adjustments to an athlete's technique that may mean the difference between winning and losing at the highest levels of professional sports. Aviation sectors utilize case study simulations, video capture, and debriefing practices to train pilots (Mavin & Roth, 2015). Interestingly, the abundant funding available for technology developments in the aviation sector has enabled early adopters (or early adaptors) in fields like medicine and education to apply emerging technologies in new fields. The medical field, for example, has embraced this set of practices to improve preparation for service delivery skills in hospitals and other care settings (e.g. Rossignol, 2017). Taken together, this collection of shared practices across various professions illustrates widespread acknowledgement of the power of VPF to improve their engagement in rehearsal, reflection, and ultimately, performance.

The use of VPF to support reflection is also a growing practice within the social sciences (Haw & Hadfield, 2011) to support performance-based skills like public speaking (e.g., Shih, 2010) and teaching (Tripp & Rich, 2012) . Teuscher, Switzer, and Morwood (2016), for example, utilize video to promote reflection on the practice of eliciting mathematical thinking. In science education, VPF has been used to facilitate post-practice debriefs about science instruction (Benedict-Chambers, 2016). Often, VPF in teacher preparation is used as an enhancement to traditional reflective essays. Kleinknecht and Gröschner (2016) compared the reflections of pre-service teachers who utilized VPF with those who wrote in reflective journals and found the VPF group reflected more deeply and specifically on both positive and negative aspects of instruction. Similar positive results of VPF have been noted by researchers in special education (e.g., Nagro, deBettencourt, Rosenberg, Carran, and Weiss, 2017) and music education (e.g., Snyder, 2011), which suggests VPF is widely applicable across fields.

## SELECTION OF A VIDEO-ENHANCED PERFORMANCE FEEDBACK TOOL

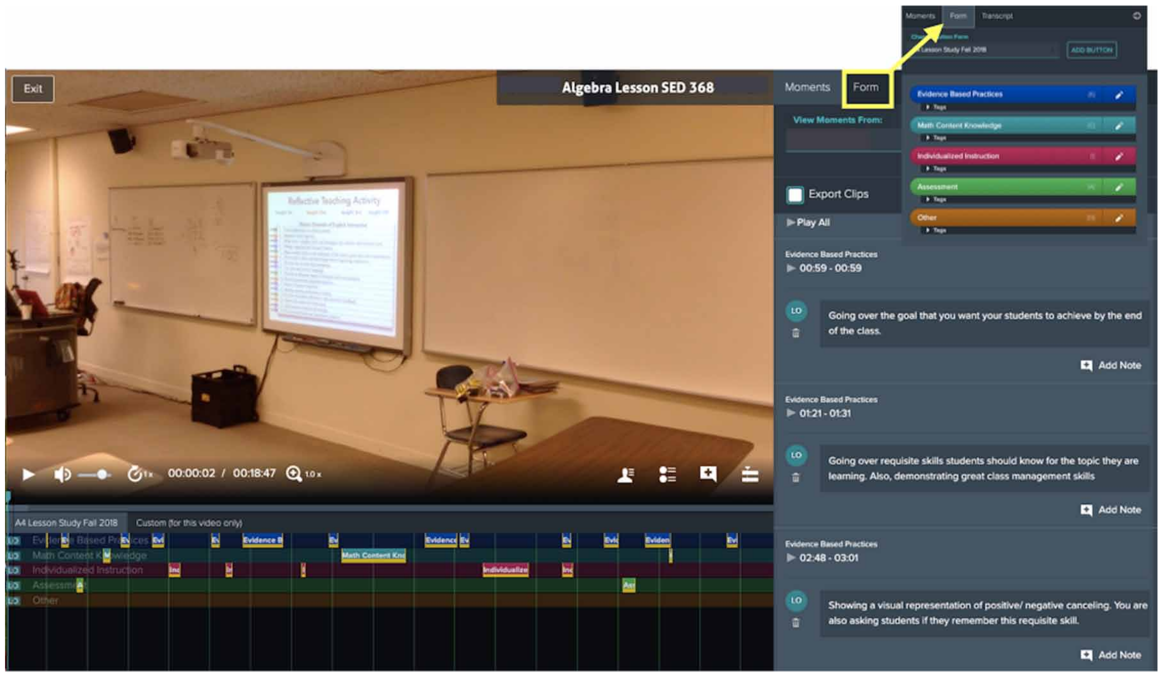
Rich and Trip (2011) provide 10 guiding questions to inform the selection of a tool for VPF, and compare different VPF tools (e.g., VideoAnt, VoiceThread, MediaThread) using these questions as guiding criteria. The VPF tool the authors use, *Vosaic,* is a newer tool that emerged in 2016, thus it was not included in this article. In Table 1, features of *Vosaic* are organized around Rich and Trip's guiding themes for tool selection. As instructional needs will vary for each user, faculty members exploring different VPF tools will find Rich and Trip's questions useful as they compare various options in search of the platform that will best fit their needs.

*Vosaic* allows users to upload videos and share them with other users. Within the platform, a user can create customizable forms that help focus attention on specific behaviors or practices; students then use those forms to identify, or *tag*, those moments in the video. Once a moment has been tagged, students can then create written reflections by annotating tagged moments. As presented in Figure 1, this platform

*Table 1. Vosaic features based on Rich & Trip's (2011) guiding themes for selection*

| Guiding Themes for Selection | Vosaic Features |
|---|---|
| Type of Annotation | • Text is used to annotate videos by adding notes onto tagged instances that have a user-selected duration<br>• Playback features allow the viewer to watch all selected moments while highlighting the corresponding text annotations |
| Reflection Framework | • A user-created form is used to structure and guide reflection on specific behaviors<br>• Each button on the form corresponds with a row in a timeline underneath, which aids visual inspection of tagged moments and where they occur in relation to one another<br>• Within each button, the user can also include different tags (i.e., labels) to create a coding hierarchy |
| Collaboration Features | • Video uploader can share the video with any user in the network |
| Data Security & Privacy | • Video recordings are stored in the secure *Vosaic* platform which uses secure *Amazon Web Services* (AWS) to host their web application and all data. All administrative tasks and traffic to their servers is handled through encrypted protocols. |
| Online/Offline | • A web-based tool, but videos and annotations can be downloaded |
| File Format | • Acceptable file formats include a wide range of options: .mov, .mp4, .avi, .mpeg, .m4v, .mod, .mts, .webm, .wmv, .ogv, .qt, .aac |
| Importing Videos | • Videos can be recorded and imported directly from a tablet using the *Vosaic* app, from web-camera, or they can be recorded on any device and uploaded to the platform later |
| Learning Curve | • Intuitive interface – screencast video tutorials are available for training students and faculty in uploading, sharing, and annotating videos |
| Final Output | • Reflection can be viewed within the platform, exported as a new video reel of selected moments, or downloaded as a .csv or .pdf file with timestamps |
| Cost | • Only pay for users who have the ability to upload video<br>• Uploading licenses range from $89-$299 annually, depending on the number of users<br>• Free users can view and annotate videos shared with them by a paid user – this is how the authors use *Vosaic* in their courses |

*Figure 1. Screenshot of the Vosaic platform showing the timeline and annotated notes*




also generates a timeline of tagged moments for each practice that can be played back individually, or as a video reel, to provide evidence for the reflection and evaluation. In the viewing window, each behavior populates on a separate row of the timeline, providing users with an added visual to illustrate how the observable practices relate to one another within the context of a specific experience. Though there are a variety of tools on the market for VPF, the authors ultimately selected *Vosaic* as their VPF tool because of the usability, the timeline features for visual inspection of tagged moments and annotations, and the responsive customer support from the company.

## VIDEO-ENHANCED PERFORMANCE FEEDBACK IN COURSEWORK: PEDAGOGICAL CONSIDERATIONS

The authors have used *Vosaic* at two institutions – a large 4-year university in the Midwest, and a medium 4-year college in the Northeast. At each institution, though the use of video to support learning has occurred for several years, only recently have faculty started incorporating VPF technologies like *Vosaic* to harness the power video has to enhance student learning. The authors regularly utilize the STaR ("See it, Try it, and Reflect on it") framework to scaffold students' reflective process with video reflection (Switzer, Teuscher, & Siebert, 2015). Early in the semester, teacher candidates typically use video to recognize practices in sample videos before writing lesson plans that include the practices ("See it"). Students are then video recorded executing those practices themselves ("Try it"), after which they use the video to guide reflection on their performance ("Reflect on it"). Students are given numerous opportunities to observe, try, and reflect throughout the semester.

While the specific ways in which VPF has been leveraged within and across courses at both institutions varies, three overarching pedagogical uses set the stage for those considering applying VPF in their courses. As previously noted, these categories include: (a) noticing and evaluating, (b) self-reflection, and (c) instructor evaluation and feedback. The sections that follow highlight application examples from the authors' work in special education teacher education and illustrate just some of the many ways instructors across higher education might apply this technology as a means to enhance or transform their pedagogy. Within each course description, the elements of the STaR framework for incorporating VPF as an instructional practice are also noted, and include explanations of how the resulting video annotations are used for both formative and summative assessment purposes.

## Noticing and Evaluating

Applying VPF at this level involves noticing the occurrence or non-occurrence of specific behaviors using video tags and annotations, and optionally making evaluations about observed practice. As a starting point, before asking learners to apply target skills, instructors often want to ensure their students can identify important practices, or the absence of these practices, in videos of others. Considered in the context of Bloom's revised taxonomy (Anderson et al., 2001), noticing or identifying practices in this way could be envisioned as a relatively less complex practice than performing those same skills, but from a learning standpoint, are an important precursor for effective application to occur. Learners who are tasked with noticing (and tagging) specific behaviors in a video demonstration must be actively engaged in the task, while summarizing one's observations after a live demonstration may not demand the same level of awareness or engagement. Instructors can add further layers of complexity to assignments at the noticing level by leveraging the full capabilities of VPF software. For example, by asking students to make evaluative judgements of the practices they observe, or by asking them to support evaluative statements by citing extant literature within their annotations, instructors can vary the cognitive complexity of the assignments they create using VPF at the noticing or evaluating level.

### Math Methods Course

In one math methods course, VPF was employed to help mathematics teachers notice and evaluate mathematical thinking. In this course, instructors guided students' reflections to include noticing and evaluating different instructional strategies for learners with disabilities. At the beginning of the semester, the instructor assigns a video clip of a lesson with one simple button on the observation form called "Good Teaching." Serving as both a pre-assessment of their pedagogical knowledge and an opportunity to familiarize themselves with the VPF platform, students are asked to tag and annotate the video to show moments they thought represented good teaching (*See it*), and explain their rationale in the accompanying annotations (*Reflect on it*). Students tagged and annotated the video at home; during class, the instructor projected the students' timelines of tagged moments to highlight trends in what they saw as good teaching to guide the class discussion (see Figure 2). Later in the semester, in preparation for tagging and annotating videos of themselves teaching a lesson, teacher candidates tagged and annotated a video of the instructor teaching a lesson. The multiple, scaffolded opportunities to practice noticing and evaluating instructional elements allows teacher candidates to acclimate with the VPF tool while deepening their understanding of mathematical pedagogy.

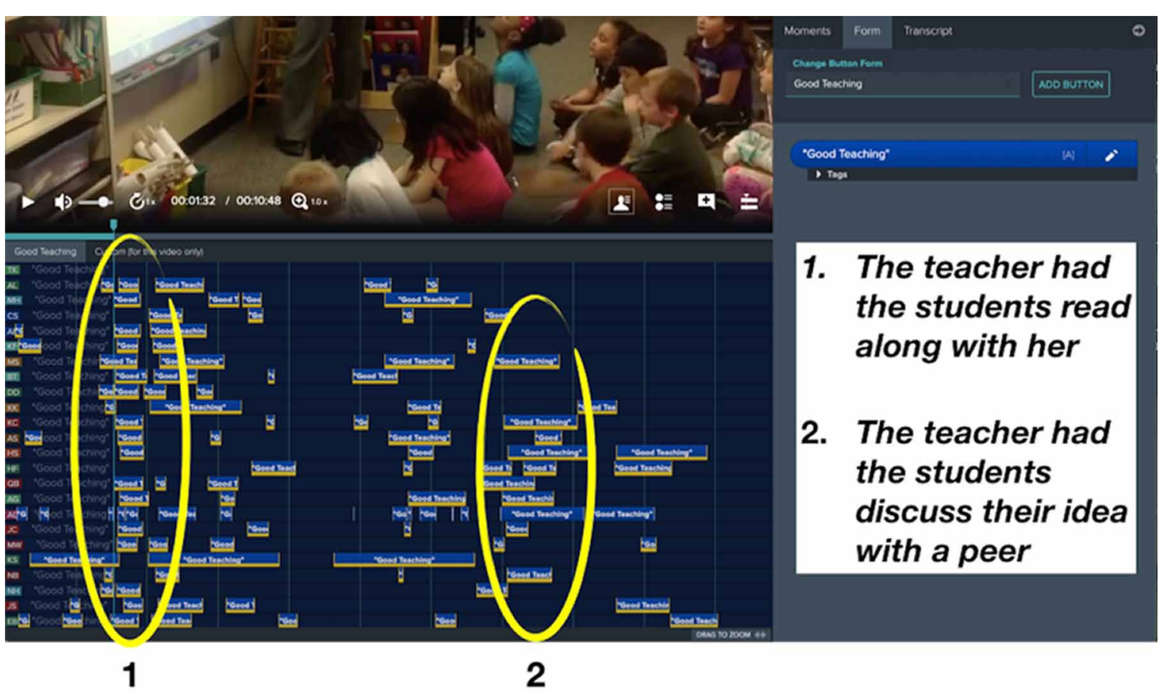
### Literacy Methods Course

The instructor of course in literacy methods taught students to use VPF to check for fidelity of implementation of evidence-based instructional strategies. After the instructor video recorded themselves modeling a particular strategy in class, teacher candidates went home and tagged/annotated the video of the instructor teaching to see if they could identify the different phases of the strategy (*See it*). Students then added reflective comments (*Reflect on it*) about the quality of execution of each phase and supported their evaluative comments with direct evidence from course texts. In this way, the instructor was able to augment the rigor of the noticing and evaluating tasks. Similar to the procedures for the math methods course, students tagged and annotated the video for homework, and the instructors used the timelines as a visual to guide class discussion. This practice capitalizes on visual patterns of the timelines as representations of both individual and group understanding.

## Self-Reflection

Another critical function VPF serves is enabling self-reflection on one's own performance. As previously described, watching video of oneself can include tags and annotations describing specific practices that a user observes, or does not observe, in their own practice or performance. When instructors use VPF as a tool to foster self-reflection, learners not only get an opportunity to identify and evaluate the actions they took, but to use this information to set goals and chart plans for improved future performance.

*Figure 2. Vosaic timeline showing student trends for noticing good teaching*



Documenting one's own professional performance and growth through tagged and annotated videos in this manner provides a clear representation of learners' strengths and serves the critical function of letting users themselves identify areas for growth.

### Special Education Instructional Methods Course

Instructors recently integrated VPF into a course designed to support special education teacher candidates' ability to (a) identify key elements of explicit instruction (*See it*), (b) apply these teaching elements into classroom-based demonstrations performed and recorded by teacher candidates (*Try it*), and (c) reflect on how well they applied these instructional elements, while evaluating the impact of the practices on student learning (*Reflect on it*). Together, the iterative combination of observation, structured practice, and reflection is designed to lead teacher candidates to a deeper level of understanding of the nuances of complex instructional practice in special education, and to provide candidates with a greater ability to apply these practices in their own teaching.

As the semester progresses, students record themselves teaching lessons in on-campus or classroom-based settings. As a summative evaluation, candidates *reflect* on their experiences *trying it*, using tags and annotations to highlight evidence of their successful performance as well as opportunities they may have missed while teaching. Early on in the semester, specific buttons are introduced sequentially to provide candidates with support in focusing their reflections. By the final video reflections of the semester, however, the buttons candidates use become broader (and thus less scaffolded) and require the candidates demonstrate not only their ability to produce accurate and deep reflections, but also to address the breadth of elements considered essential to explicit instruction. Students' identification of, and reflection on, important instructional moments provide instructor with important information about what they notice about their practice, and how they interpreted these actions in relation to what they know about best practices.

## Feedback for Evaluation

A final distinct use of VPF is to provide learners with feedback about their performance and as a means for formative and summative evaluation. As feedback provides learners with critical information upon which to make adjustments to their behavioral performance, it is essential for instructors to find ways to make sure learners receive feedback that they can connect to specific actions they took. For example, in a summary of global feedback after a health care case study simulation, or sports competition, behavior-specific feedback is difficult to convey in writing in a way that provides actionable suggestions for a learner's future practice. By contrast, VPF allows instructors to embed their feedback in tagged moments to provide a direct point of reference for the learner. Just as learners can tag moments to show their instructors what they notice in a video, instructors can also use tags and annotations to focus learners' attention on important aspects of their own performance, and improve their skills on subsequent attempts at the same task.

### Systematic Instruction Course

Most recently, students enrolled in courses connected with practicum placements in K-12 schools started using *Vosaic* to record themselves teaching K-12 students. One course that heavily utilizes this platform is a course on systematic instruction. In the field of special education, systematic instruction is an evidence-based practice for students with disabilities with the most intensive support needs (Collins, 2012). Students must execute these practices with fidelity and collect both baseline and post-instruction data to determine whether the systematic instruction is effective in helping their learners meet the specified outcomes. The course instructors model systematic instruction during class (*see it*) and teacher candidates have the opportunity to *try* and *reflect* on those practices during class before they tried and reflected on them with real students in their practicum placements. Without the use of a video platform like *Vosaic*, the instructors were previously unable to observe and provide feedback to teacher candidates in the field because they were located in many different schools. Now, teacher candidates upload videos of their instruction throughout the baseline and intervention period and are given the opportunity to self-reflect and to receive feedback from the instructors.

## Clinical Experience Course

Another practicum course that incorporates VPF is the initial clinical experience course. For several years prior, there was a project in the course that required teacher candidates to record themselves teaching and then create a table with timestamps and comments to reflect on their execution of different instructional elements aligned with the Danielson Framework (The Danielson Group, 2017). Similar to the other courses, students were first taught what those elements looked like in class (*see it*) before they were asked to *try it* and *reflect on it.* The course instructors then assign students to small groups for providing peer feedback about their video. While previously, the students did upload their videos to the learning management system for the instructors to see, because the reflection was not linked to the video and only referenced by timestamp, it was not feasible for the instructors to go back to the videos to see if the timestamps actually align with what the students wrote in their reflections. In more recent semesters, teacher candidates complete this assignment within the *Vosaic* platform instead of in a separate table. This gives the instructors the ability to easily view the video at the same time they read student comments and make it easier for students to use the video clips to guide their post-instruction debriefs.

Throughout courses across both institutions, VPF is utilized for both formative and summative assessment of student progress toward individual course outcomes. Ideally, the incorporation of VPF throughout their program will also help prepare them for their program-level summative assessment. Both institutions are in states that require their special education teacher candidates to complete performance-based assessment (i.e., edTPA) in order to earn teacher licensure. One of the tasks on this licensure assessment requires students to upload a video and reflect on their instructional practice. While the assessment does not require teacher candidates to use a VPF platform for this task, students and instructors note the benefit of using VPF to prepare them for this component (see feedback sections below). The authors' experiences and accompanying examples are rooted in special education teacher preparation, however, the "See it, Try it, Reflect on it" framework (Switzer et al., 2015) can be utilized as a framework for implementing VPF for the purposes of formative and summative assessment across higher education disciplines, particularly for those with performance-based outcomes.

## VIDEO-ENHANCED PERFORMANCE FEEDBACK FOR INSTRUCTOR REFLECTION

Effective approaches for teaching and learning can be applied seamlessly across educational contexts. Thus, the approaches and platform described in this chapter designed to facilitate college students' performance and development can similarly be used to support instructors' own professional development and practice. Students who use *Vosaic* within their courses to hone instructional skills may also benefit by observing the parallel use of video by their instructors to enhance their teaching in the higher education setting. In this way, faculty can model effective uses of VPF platforms like *Vosaic* by practicing what they preach.

Instructors at the midwestern university utilize the same VPF platform as their students (i.e., *Vosaic*), to reflect on their own teaching and promote professional growth. As part of the department's mentorship program, faculty across all stages of the career ladder incorporate peer-to-peer video observations with post-observation debriefs. The mentoring program, called GROWTH, stands for **G**oal setting and, **R**eflection, **O**n, **W**ho you are and what you want to accomplish in, **T**eaching and research in **H**igher education. Within GROWTH, faculty are paired with colleagues within and across departments for live and video-recorded formative peer observations of teaching. Faculty who participate in this kind of a mentoring program benefit by having an expanded support network, honing their professional competencies, and building a clearer perception of their own scholarly identity (Beane-Katner, 2014; Gardiner, Tiggemann, Kearns, & Marshall, 2007), especially as it relates to instructional practice.

By integrating VPF into the mentorship program, faculty have the added benefit of observing themselves teach, receiving targeted feedback, and having opportunities to identify video-based evidence tightly linked to their teaching goals (Vidmar, 2005). Many GROWTH participants use peer feedback and/or video evidence within *Vosaic* as artifacts for their portfolios for their annual performance review. While this is a rather unexplored area of research in higher education, emerging research on the use of self-selected videos as a part of the teacher evaluation process in K-12 schools suggests promising potential for this kind of an approach. Kane, Gehlbach, Greenberg, Quinn, and Thal (2015) found when teachers themselves selected the videos for evaluation rather than having supervisors conduct live observations, the teachers noticed more about their instruction, and they also perceived their evaluations as more fair and their supervisors as more supportive. Because the GROWTH mentorship program is not directly tied to faculty evaluation, faculty have the choice of what to include as artifacts for their evaluation. Mentorship programs should strive to maintain choice as a primary consideration when using VPF for teacher evaluations, and thereby help faculty feel supported, develop relationships, and enhance their teaching (Ambler Harvey, & Cahir, 2016).

## INVESTIGATING THE BENEFITS OF VIDEO-ENHANCED PERFORMANCE FEEDBACK ANALYSIS IN HIGHER EDUCATION

Instructors and students from the authors' institutions have frequently and informally noted the benefits of incorporating VPF into their coursework. In an explorative case study, the authors collected student and faculty perceptions in a survey collecting both quantitative and qualitative data. Comprised of both Likert scale and open answer survey questions, and administered over three semesters, the survey was designed to gather more detailed student and faculty perceptions about the affordances and barriers of using *Vosaic* in special education teacher preparation courses.

## Student Feedback

For each of three consecutive semesters, the authors sent feedback surveys to approximately 180 teacher candidates who used *Vosaic* in one or more of their college classes, and received 118 responses (over 60% response rate). In this section, descriptive statistics of Likert scale responses are summarized, and the resulting themes are reported from the authors' coding and analysis of teacher candidate responses on open-answer survey questions.

### Usability

Overall, nearly 90% of teacher candidates agreed or somewhat agreed with idea that Vosaic was easy to use for reflection (see Table 2). Of the remaining respondents, some reported challenges that were related to user error or a lack of fluency with the tool: "It is hard to tag a specific event right where you want the tag;" "the save button did not work on my notes, I kept having to exit out and get back to my video." The survey also included an open-answer question asking students to provide any other additional feedback about their experience using Vosaic and the value of video for reflection overall. Examination of responses to this question revealed 24% of students experienced some difficulties using the platform; however, nearly half reported that it did not stop them from liking the tool or seeing the value in it (also noted by their favorable ratings on the Likert scale). In fact, about the same number of students specifically mentioned how easy the tool was to use and another 22% used the word "enjoyed" (or another synonym) to describe the tool and/or process. In fact, many of the areas described by some as challenging (e.g., saving comments, adjusting moment lengths) were specifically described as easy by other students. This underscores how important it is for users to feel comfortable with any technology used to support learning, and that in order to maximize the impact of a tool, users must also develop familiarity with support resources (e.g., https://vosaic.com/blog; https://vosaic.com/support) and take time to learn and practice applying specific troubleshooting strategies (e.g., reloading a webpage, accurately placing a tag).

*Table 2. Descriptive statistics for the three Likert scale survey questions*

| | Rating | | | | |
|---|---|---|---|---|---|
| **Survey Statement** | **Agree n (%)** | **Somewhat Agree n (%)** | **Neutral n (%)** | **Somewhat Disagree n (%)** | **Disagree n (%)** |
| The Vosaic platform was easy to use for my reflection | 59 (50%) | 43 (37%) | 7 (6%) | 5 (4%) | 3 (3%) |
| The Vosaic platform helped me notice strengths/areas for improvement in my teaching | 82 (70%) | 23 (20%) | 8 (7%) | 3 (3%) | 1 (< 1%) |
| For a lesson reflection, I would rather tag/annotate videos on Vosaic over writing a reflective essay | 92 (78%) | 12 (10%) | 5 (4%) | 4 (3%) | 5 (4%) |

### Improving Ability to Notice

The second survey question asked participants to rate their agreement with a statement about *Vosaic* helping them notice strengths and areas for improvement in their teaching. Similar to the first question, about 90% either agreed or somewhat agreed with this statement. Students who selected agree or somewhat agree were presented with a follow-up question asking them to describe what about the platform helped them notice. The authors used an inductive approach (e.g., Strauss & Corbin, 1999) to analyzing the 50 open-answer responses to this question. First, they employed line-by-line open coding and subsequently applied axial coding to categorize the codes into a hierarchy.

All phrases from the responses fall within three major themes. The first theme, *video as an enhancement to reflection*, was represented in 70% of all responses. Specifically, the most common reason for video enhancing reflection was simply the ability to watch themselves (46%). This was followed by the ability to pinpoint specific examples for evidence (24%) and being able to notice things they did not pick up on during the experience (12%). *Program features* emerged as the second theme – 40% of all responses referenced a specific feature of *Vosaic* (beyond inclusion of video) that helped them notice. Approximately 30% of responses referred to a recursive reflective process and referenced the ability to pause, rewind, and review video segments. Other features described included the ability to alter the speed at which the video is played, the ability to adjust the length of tagged instances, and how the program was "easy" to use. A final theme, *instructor facilitation*, included comments related to the reflective prompts or framework provided by the instructor (16%), feedback received from the instructor (2%), and how the instructor encouraged them to connect what they saw to the course texts (4%).

### Preference for Video Reflection

Prior to the incorporation of VPF into their coursework, most instructors assigned essays for reflection on teaching, which typically require students to describe specific scenarios from their teaching in addition to reflecting on them. For this reason, the third question on the survey asked whether teacher candidate preferred to reflect via VPF rather than writing an essay. Approximately 90% of teacher candidates agreed or somewhat agreed with this statement while only about 7% disagreed or somewhat disagreed with this statement. A follow up question was presented to those few who disagreed, with three respondents elaborating on their preference. One student noted that writing an essay is easier, though not enjoyable. A second student described the process of writing lengthy text within *Vosaic* as "awkward", so they preferred using an essay format, while a third student described essays as allowing "more choices on how I want to reflect on my experience." This student may be comparing their structured VPF reflection to a less structured essay reflection based on memory; however, the flexibility of any assignment will depend on the reflection framework and assignment directions: a theme addressed later in this chapter.

## Faculty and Instructor Feedback

The authors also surveyed faculty members who utilized *Vosaic* with their students and/or for the GROWTH mentorship program to discover how they use it with their students, and to summarize any perceived benefits they note related to reflection. As of the current semester, 13 instructors across the two institutions utilize *Vosaic* to help students notice, to promote self-reflection, and/or for student evaluation. Instructors described similar benefits as some of the teacher candidates including the ability to notice aspects of instruction they would not have seen without post hoc video review. One instructor highlighted the specificity and objectivity of the students' reflection in comparison to their essays because the video provides supporting evidence. Another noted the logistical benefit of having the reflection and video evidence in the same place, allowing the instructor to easily view the exact moment of instruction the student is reflecting on. A final comment from an instructor insightfully described how VPF is most helpful for shorter, more specific feedback and not as helpful for general or holistic feedback.

Of the 13 instructors using *Vosaic* with their students, seven also use it for their own professional development through the GROWTH mentorship program. In Spring 2018, GROWTH faculty completed a different survey to gather program feedback, which included questions about using VPF for reflection and peer debrief of their teaching. Of the 13 faculty respondents, 12 (92%) reported it was helpful to watch videos of themselves teach, 11 (85%) reported it was helpful to watch videos of others teaching, and 10 (77%) found the peer debrief process helpful. Also noteworthy is the difference in perceptions from the fall semester to the spring semester. For the Fall 2017 GROWTH participants (the inaugural semester), only 6 (50%) reported it was helpful to watch videos of themselves, 5 (42%) reported it was helpful to watch videos of others, and 6 (50%) reported the helpfulness of peer debriefs. A majority of the participants were the same in the Fall 2017 and Spring 2018, so the more positive perceptions ratings in the spring may be due to gaining more fluency with *Vosaic*, which was used to facilitate observations and debriefs.

## UTILIZING VIDEO-ENHANCED PERFORMANCE FEEDBACK TO SUPPORT LEARNING

Based on the authors' implementation of VPF in their courses, and coupled with feedback from students and colleagues at their institutions, three major themes emerged related to utilizing VPF tools as an increasing student engagement with instructional technology: (a) the role of technology in instruction; (b) the fluency required to effectively utilize instructional technology; and (c) the instructor's role in facilitating reflection with technology.

### Technology as a Change Driver

In order for VPF technology to exert transformative power on teaching and learning in classrooms, educators should consider the ways in which the unique features inherent to the technology can fundamentally alter the ways in which students build knowledge about professional practices (i.e., noticing), critique the quality of rehearsal (i.e., reflection and self-reflection), and receive input from instructors about the quality of their performance (i.e., via instructor feedback and evaluation). The TPACK framework can play an integral role in helping faculty consider if, and to what extent, VPF may stand to improve students' understanding and application of essential ideas and practices in a given course. Clearly, however, countless intricacies serve to differentiate the corpora of knowledge and skills across diverse fields, and it seems likely that certain majors, programs, and courses may be better suited than others to take full advantage of the affordances VPF programs offer both instructors and students. In other words, fields in which learners develop and hone observable skills and behaviors are better positioned to leverage the power of VPF than those fields in which the primary skills learners acquire are more cognitive and internal, and less visibly demonstrable. Still, cross-cutting elements of sound pedagogy (i.e., feedback, evaluation, and reflection) are mainstays of effective instruction across the wide array of disciplinary pursuits; it can be instructive, therefore, to contrast how different approaches to delivering feedback and evaluation, and supporting reflection, impact instructors' ability to facilitate these more cognitively complex tasks. In so doing, the value associated with VPF tools becomes more visible to current and potential users.

A useful starting point is to consider the traditional essay as an instructional vehicle to facilitate reflection, and it is important to note the advantages that the essay approach affords learners without the incorporation of additional technologies. Namely, it provides learners time to collect their thoughts about a recent performance, and represent those ideas in an organized manner. Ideally, learners writing reflective essays without the support of video would be taught to support their observations and evaluations with specific examples from their performance. As previously described, one notable disadvantage to this approach is that learners' identification of specific examples must rely on memory, which may be faulty or incomplete. Taking the SAMR (2006) model into account, one way to augment this practice would be to supplement reflective essays with the use of video evidence. With this addition, learners have evidence to review as they construct their written reflections, but without specific evidence in the form of timestamps, the video remains separate from the reflection, making it difficult to review both together.

VPF programs circumvent this limitation by providing users with the ability to insert written comments within the program itself, as opposed to in essay form. Users can insert comments at paused timestamps in most VPF programs, thereby clarifying links between users' reflective comments and the moments on which they are reflecting. This represents a major improvement over the practice of using separate video and essay reflections because the comments are positioned at a specific part in the video, making it easy for learners and instructors to share a common point of reference when constructing or evaluating reflective comments. Further enhancing its benefits, some VPF tools have additional instructional features such as being able to incorporate rubrics into the program, and providing seamless integration with learning management systems (LMS). This level of implementation of VPF certainly modifies the reflective process, and viewed within the SAMR model, asks learners to engage in technology usage at the upper levels of cognitive complexity.

Two features of *Vosaic* hold particular potential to further transform instructors' ability to promote reflective practice beyond what is currently possible with other VPF programs: the duration moments and timeline features in *Vosaic* enable the redefinition of the reflective task. VPF that includes moments with duration lets users not only identify specific paused moments to which to connect their reflections, but allows users to select the duration of those moments, capturing the full breadth of the behavior or event. This feature facilitates a truly recursive reflective process where users can tag and annotate moments of a specific duration, review and revise those annotations based on instructor feedback, and evaluate and debrief with peers or instructors as they make plans to improve for future performance. Instructors or peer mentors who want to review a learner's reflections at any point in this process can utilize a 'play all' feature to watch the exact moments the user chose to showcase, along with their reflective comments. Users can also select moments to be compiled into a video reel of evidence for a portfolio or website, expanding the purposes for which the technology can be used.

*Vosaic's* timeline feature provides additional potential to revamp users' experience or perspective when reviewing trends across tagged moments. For example, this timeline could be useful in helping students notice patterns in how often and how long they spend conveying information compared to how long they spend eliciting student responses. Having different rows for different teacher actions allows the user to see any overlap or sequencing of those actions that would not be as noticeable with paused moments in a single row of a timeline. By harnessing the potential of these features, programs like *Vosaic* can become a tool for the redefinition (SAMR) or transformation of the reflective task.

## Fluency with Instructional Technology

Like any tool used for learning, it is vital for users to have some degree of fluency with the lower order skills related to technology use in order to focus their cognitive efforts on the higher order skills required for deep learning. Student perceptions of the usability of *Vosaic* were quite positive, as nearly 90% of students agreed to some extent that it was easy to use for their reflection. Despite the generally positive view, in some comments, teacher candidates detailed their challenges using *Vosaic* including difficulty tagging or adjusting moment lengths, video upload speed, and the inability to save comments. A majority of these issues were related to differences in user proficiency and fluency with the program because, contrastingly, at least the same number of students reported similar actions as "easy" to achieve. Though the instructors found the tool to be fairly intuitive, some students noted the learning curve required to feel comfortable with the tool.

Different instructors across institutions utilized varying methods to teach basic functionality of *Vosaic*. For example, some instructors modeled directly with in-class activities, some provided an instructional video, and some relied on student knowledge from use in a previous semester. Thus, future lines of inquiry must also explore the most effective ways to teach students how to use VPF tools. Based on the authors' experiences, a combination of the first two methods may be more effective than either in isolation. For example, it can be time consuming to explicitly teach how to use a technology in class, and some students may prefer to explore on their own, so it may be more beneficial to provide a range of opportunities to practice with some degree of instructor feedback. Additionally, instructors who have used *Vosaic* for several semesters also tend to provide multiple scaffolded opportunities to practice with the tool before using it for any kind of summative evaluation. This approach allows students to become accustomed to program features over time.

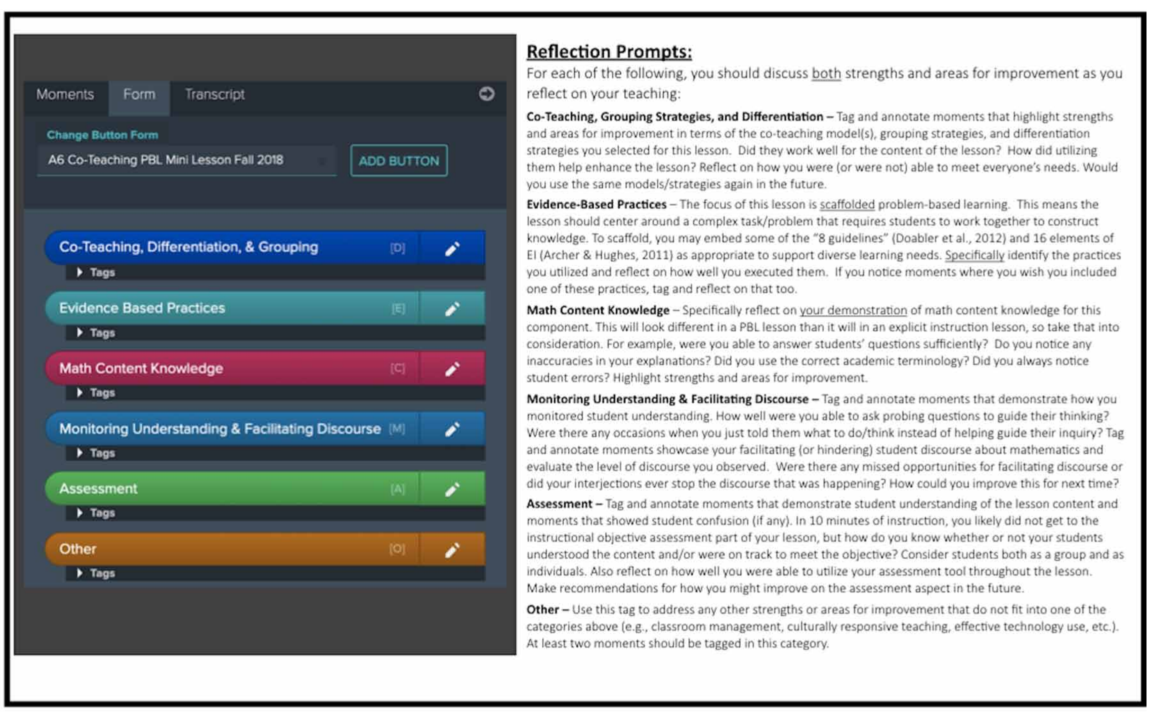
Instructors also reported varying levels of comfort with the tool themselves, and this could have impacted their ability to help students troubleshoot when issues arose. For example, there was a learning curve for faculty who used *Vosaic* in the GROWTH mentorship program. More positive perceptions of VPF were noted in the spring semester after participants had more experience with *Vosaic*, lending support to the notion that additional practice with the tool promotes user satisfaction. Also noted in the survey responses was a decreased number of faculty (from 3 to 0) reporting technology as a barrier to participation in GROWTH, which suggests the more positive perceptions in the spring semester were attributed, at least in part, to improved fluency with the technology itself.

## Facilitating Experiential Learning Through Reflection

The instructor's role in experiential learning (Dewey, 1938; Kolb, 2015) is to act as a facilitator or guide to support student reflection. VPF technology in and of itself should not be expected to produce higher quality reflection. Researchers have found pre-service teachers, for example, do not often notice important pedagogical elements or aspects of student teaching when viewing video without any framework or guidelines (e.g., Sherin & van Es, 2005). Those who study VPF for reflection support the use of frameworks, guidelines, questions, or protocols to support the reflective process (e.g., Kleinknecht & Gröschner, 2016; Nagro et al., 2017; Star & Strickland, 2008).

Within their feedback, many students referenced aspects of the reflective process that were facilitated by the instructors and the frameworks used for reflection. In this chapter, the authors described the use of Switzer and colleagues' (2015) "See it, try it, and Reflect on it" framework as a broad structure for integrating VPF into coursework. In the courses that have utilized VPF longest, instructors consistently utilize assignment-specific reflective prompts to help guide student thinking and elicit deeper and more specific reflections. For example, in a math methods course, the instructors match the form buttons in *Vosaic* with guiding questions in the assignment description, as shown in Figure 3. Instructors often encourage students to keep a copy of those prompts next to them while they reflect on the video. Providing guiding questions/prompts helps communicate expectations and focuses their thinking. Some students need this level of structure and guidance more than others, and though some may successfully reflect without this guidance, providing the support certainly did not present a barrier to any student's learning. These findings support those of other researchers who identify guiding questions/frameworks as essential scaffolds to support the reflection process (e.g., Nagro et al., 2017).

*Figure 3. Sample Vosaic form with matching guiding questions*



## FINAL THOUGHTS ON INTEGRATING VIDEO-ENHANCED PERFORMANCE FEEDBACK ACROSS DISCIPLINES

Based on the authors' experiences, the extant research on VPF, and other user-generated feedback, the following section provides recommendations and considerations for increasing student engagement with VPF across higher education disciplines. The three main ways the authors have utilized VPF (i.e., facilitating noticing, self-reflection, learner evaluation) are not unique to teacher preparation programs, but are applicable across the higher education landscape. Faculty whose work involves preparing students to develop observable skills can start by identifying the specific performance-based outcomes their students need to achieve. The following questions can begin the consideration process, in order to spark dialogue with colleagues who share responsibility and oversight for ensuring students acquire end-of-program skill proficiencies: How do we currently evaluate students on performance or skill-based outcomes? What are the strengths of our approaches, and where are our opportunities for growth? To what extent do we provide video-based models of best practice, and how can we tell when students notice best practice of important skills at a granular level? How/does reflection currently play a role in student development of performance outcomes, and how do we scaffold this process for students? Is reflection sufficiently detailed and tied to specific moments, or do students generally reflect on a more general or global level? Would the ability to reflect on more specific moments provide the potential for more accurate demonstration of learning, and enhanced assessment? Dialogue surrounding questions such as these can help attune faculty to the most critical areas of practice VPF tools stand to impact and redefine.

Lastly, before adopting any particular technology tool, it is helpful to explore whether one's colleagues are already using VPF in their courses or programs. Instructor comfort and experience with a particular VPF tool can serve a facilitating role in its implementation, thus it is worth investigating its concurrent use across departments. Additionally, institutional licensing can provide substantial per-user cost savings. Cost is another aspect faculty should consider in this process: free tools and paid tools are both widely available, though, free tools often have limited features, and thus may be less capable of transforming reflective practice. For faculty who are just beginning to explore the potential of VPF tools, free versions of these tools can be a sensible way to reduce cost while providing access for both faculty and students to experience the nascent potential of VPF as an instructional and assessment tool. As with any new pedagogical innovation, allotting sufficient time for faculty to practice using VPF technology can further help prepare for its most effective and efficient implementation.

The tool the authors selected for their VPF work, *Vosaic*, was best matched to their goal of fundamentally transforming reflective practice, though it is important to acknowledge there are many factors instructors may want to consider when selecting a VPF tool. Rich and Trip's (2011) 10 guiding considerations can be a useful lens through which to evaluate VPF tools on the market. As technology has evolved since the publication of Rich and Trip's article, instructors may also be wise to consider additional features like rubric alignment and LMS integration during their selection process. Ultimately, instructors must think about their specific needs surrounding reflection, and performance-based evaluation, and allow their goals related to these practices to drive this process. If facilitating post-experience debriefs is the primary need, then one should select a tool that allows for tagging of moments with a duration so they can be played back with ease. If, alternatively, one's primary need is providing feedback to students for their evaluation, using a tool that has rubric and/or LMS integration may be more important, and it may not matter if the moments have duration or a visual timeline. Like any instructional technology, VPF tool selection must be guided by pedagogy, learner strengths and needs, and the facilitator's intended learning outcomes. Only then can faculty ensure VPF implementation remains rooted in goals, and is embedded in evidence-based instruction in ways that increase student engagement and transform teaching and learning.

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## KEY TERMS AND DEFINITIONS

**Experiential Learning:** A process of learning through reflection on doing.

**Noticing:** A student's ability to recognize practices in real-world examples.

**Reflection:** Utilizing evidence to support the intentional and critical thinking about one's knowledge, beliefs, or practice.

**Scaffold:** A temporary instructional support to help students achieve a learning outcome.

**Timeline:** A visual feature in the VPF tool, *Vosaic*, that shows stacked rows of timestamped, user-specified video clips.

**Video-Enhanced Performance Feedback (VPF):** A broad term representing a range of terms used throughout the literature (e.g., video reflection, video debrief, video-assisted performance assessment, video analysis), all of which have the shared goal of using video tagging and annotation to support the reflection process.

**Vosaic:** The VPF tool used by the authors of the chapter.

# Chapter 7
# Digital Literacies in the Classroom:
## Authentic Opportunities for Student Engagement

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## ABSTRACT

*In efforts to improve students' digital literacies on a STEM-focused campus, one university created a digital literacies initiative to support both faculty and students. Faculty development programming supported the development of assignment parameters, detailed assessment rubrics, and scaffolding activities. A campus tutoring center was piloted to support students' acquisition of digital literacies. This chapter offers examples from three faculty members who participated in the digital literacies initiative and implemented digital literacy assignments in their courses. The researchers offer best practices for campuses interested in developing digital literacy initiatives.*



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## INTRODUCTION

Improving digital literacies is described as a significant challenge for 21st century colleges and universities by the New Media Consortium in their *2016 Horizon Report*. Today's students grow up engaging with technologies, social media, and other digital environments, but they often lack digital skills seen as important in the contemporary workforce (Oblinger & Oblinger, 2005; Jones & Cross, 2009; Brumberger, 2011). While students may be adept as consumers and users of digital technologies, they continue to need critical digital literacy skills to be persuasive, responsible 21st century technologists (Selber, 2004). Recent research also suggests that students are not receiving the support they need to develop these skills (Parr, 2015).

Students also often struggle with understanding how to apply conceptual information learned in the classroom to "real-world" situations. Providing students with authentic assignments, in which students have opportunities to engage in hands-on, process-based tasks, is an effective way to help students apply conceptual knowledge. Additionally, as students entering the workforce are increasingly expected to have the skills necessary to produce digital deliverables, authentic digital assignments are an effective way to allow students to develop content knowledge while also developing foundational digital literacies.

However, because of the rapidly changing nature of digital technology, the skills, competencies, and practices that students develop in order to become digitally literate are continually evolving. In 2002, The U.S. Educational Testing Service identified "five components [of digital literacy that] represent a continuum of skills and knowledge," and these skills are scaffolded in order of "increasing cognitive complexity": accessing information, managing information, integrating information, evaluating information, and creating information (as cited in Martin, 2008, p. 158). Several years later, the ITU Monitor (2006), a longitudinal survey that assesses the use of information and communications technologies for pedagogical purposes, identified three digital competencies for students: "accessing information," "integrating information," and creating rhetorically effective digital texts (as cited in Søby, 2008, p. 140). Bawden (2008) identified six central competencies associated with digital literacy: "reading and understanding digital and non-digital formats," "creating and communicating digital information," evaluating information, "knowledge assembling," "information literacy," and "media literacy" (2008, p. 29). In light of these overlapping yet still distinct descriptions of digital literacy, researchers, like Martin (2008), conceive of digital literacy as multilayered, relying not only on traditional alphabetical literacy, but also technological literacy, information literacy, media literacy, visual literacy, and communication literacy (p. 158-62).

Several benefits stemming from digital literacy indicate the need for instructors to support students in developing these skills. For example, students with underdeveloped digital literacies are at a disadvantage, as "limited knowledge of basic digital literacy skills inhibits success in higher education [and is] essential to meaningful, empowering communication in the 21st century" (Bancroft, 2016, p. 46). Additionally, Barak (2018) observed that digitally literate students were more likely to be flexible and open to change, with students who were digitally literate and preferred to work collaboratively were found to be most flexible (p. 121). The links between student success and digital literacy further demonstrate the benefits of incorporating digital assignments in higher education classrooms.

Instructors observe a need not only to develop their own digital literacies but also to incorporate digital assignments in the classroom. However, many instructors are hesitant to do so for a variety of reasons, including a lack of familiarity with the digital tools needed to complete the assignment, uncertainty about how to evaluate the assignment, or a lack of time in the classroom to instruct students in how to use the necessary digital tools. Thus, digital design studios and multiliteracy centers can supplement instructor support by offering a range of digital literacy support, helping students to build functional, as well as critical, digital literacies.

Building these essential digital literacy skills in the classroom requires effective pedagogical decision-making. In her review of digital literacy support for students in higher education contexts, Bancroft (2016) concluded that "learners best retain and apply [digital literacy] skills if taught in meaningful contexts with personalized support" and that "face-to-face, one-on-one tutoring is typically the most effective means of transfer" (p. 50)[1]. However, as the concept of digital literacies is multilayered and involves various other literacies, scholarship in this area often focuses on best practices for teaching particular types of digital literacy. For example, Neumann (2016) noted the importance of information literacy for first-year students and identified assignments that encourage critical thinking and navigating library or other resources to locate scholarly articles as best practices for encouraging the development of information literacy, while Matrix, Hodson, and Hodson (2014) noted the importance of visual literacy in the development of digital literacy, identifying infographic assignments as a way for students to develop skills in research (information literacy), design (visual literacy), and "technical fluency" (technological literacy), all of which contributed to students' development of digital literacies (para. 10). The research regarding instructors incorporating digital literacies indicated positive outcomes, yet the nebulous concept of digital literacy means that its incorporation must be contextually situated and that additional research is required to develop educational best practices.

Thus, in an effort to continue the argument for the importance of digital literacies and authentic learning experiences, and to identify some best practices for the inclusion of digital assignments in higher education, this chapter documents how a Digital Literacies Initiative, involving the creation of a Digital Studio on a STEM-focused campus, created authentic opportunities for student engagement while allowing students to practice and develop various components of digital literacy. The researchers provide a review of digital literacy scholarship and relevant research on authentic student engagement and offer the following examples of how faculty can create digital assignments as authentic student engagement opportunities for students:

- Conducting Authentic Genre and Audience Analysis in Technical Report Writing
- Making Authentic Connections through Social Justice Podcasts
- Communicating STEM Content in Authentic Ways

The chapter concludes with a discussion of best practices for faculty development and implementation.

## BACKGROUND

### The Need for Digital Literacies

The researchers' institution is a private university specializing in aviation and aerospace, offering degrees in four colleges: aviation, business, engineering, and arts and sciences. Students arrive on campus with strong technical backgrounds; however, these skills fall short when using technologies to communicate professionally. Results from a 2016 campus survey of faculty (n=187) suggest that more support for students' digital literacies is needed:

- Only 50% of campus faculty believe students are literate at using digital tools productively.
- Only 38% of campus faculty believe students are literate at digital communication.
- Only 36% of campus faculty believe students are literate at digital media production.

Many students continue to struggle to develop digital artifacts such as technical reports, websites, infographics, podcasts, short instructional films, and research posters. Simply mastering STEM content is not enough when students enter the workforce; faculty recognize that *communicating* STEM content is an important outcome not yet being achieved by many students.

The Digital Literacies Initiative at the researchers' institution was created in response to these concerns. Faculty also acknowledged that they themselves did not necessarily have the digital skills to teach students, but instead would need support from digital experts. Compounding these skill gaps is a digital divide. This concept describes the benefits afforded to students from economic and social backgrounds who have had more access to digital technologies and additional opportunities to develop digital literacy skills; simultaneously, the digital divide penalizes those who have grown up in less technologically-rich environments (Neuman & Celano, 2006).

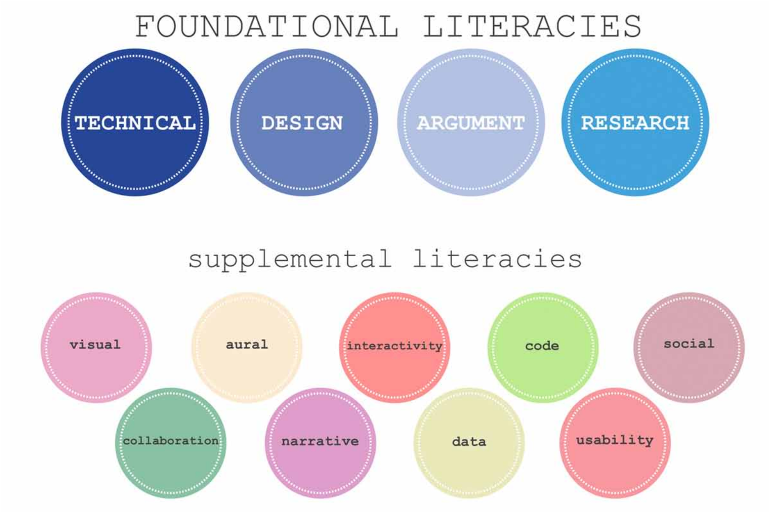
To address these skills and equity gaps, the campus' Task Force on Innovation, a community of faculty, staff, and administrators on campus, created the Digital Literacies Initiative in 2014. The initiative focused on two aspects of digital literacy development: faculty development and student support. The campus' Center for Teaching and Learning Excellence (CTLE) offered faculty development workshops and one-on-one consultations to help faculty to produce effective assignment sheets, detailed rubrics, and lesson plans for in-class scaffolding. To support both students and faculty, the campus created a companion Digital Studio, a tutoring space designed to provide equitable access to digital technologies, supplemental instruction of digital literacy skills, and opportunities for students to engage in authentic production of digital artifacts as a part of their coursework for faculty.

## Faculty Development and Digital Studio Support

In 2015, CTLE worked with 7 pilot faculty from across disciplines to develop digital literacy assignments. At a half-day workshop, faculty were introduced to a digital literacies model adapted from the University of Southern California's Institute for Multimedia Literacy project (https://cinema.usc.edu/iml/resources/handbooks/studenthandbook.cfm).

The adapted model highlighted both foundational literacies (digital, network, design, argumentation, and research) and supplemental literacies (presentation, visual, sonic, interpretation, annotation, collaboration, narrative, pedagogical, interactivity, and code). Faculty were then introduced to a variety of digital genres that provide opportunities for digital literacy development, including slideshows, podcasts, posters, infographics, movies, and screencasts. In following semesters, faculty developers worked closely with faculty to create assignment sheets, rubrics, assessment measures, and models to be used in classroom delivery. An additional 13 faculty participated in the Digital Literacies Initiative in the following semester, producing a range of digital literacy assignments, rubrics, and scaffolding activities for students. All campus faculty were offered an opportunity to participate in the grant and self-selected into the program. Faculty participants were drawn from each of our 4 colleges and ranged in rank from instructor to full professor. Some of the departments represented in these first two cohorts were Applied Aviation Sciences, Engineering Fundamentals, Humanities/Communication, Mathematics, Management/Marketing/Operations, Physical Sciences, and Security Studies and International Affairs.

*Figure 1. Adapted digital literacies model*




To understand faculty perceptions of the value of CTLE's Digital Literacy Workshop, CTLE collected data in an online survey from the 20 faculty from both Fall 2015 and Spring 2016 semesters. The survey was provided to workshop attendees immediately after the Digital Literacy Workshop and asked 5 questions about the value and usefulness of the workshop and its materials. They were also provided with an open-ended question asking them to offer advice for future workshops and faculty development support. When asked to what extent faculty found the workshop and its materials valuable, 100% of faculty found them valuable (18/20 responded).

To support students outside of the classroom, the Digital Studio was established as a tutoring center. An initial budget of $50,000 was spent on hardware and software needed, minimal cosmetic changes to a renovated classroom, and student tutor wages. The Digital Studio has always been staffed by undergraduate student tutors with a range of expertise in radio/audio production, graphic design, web design, photography, and movie-making. The Studio initially employed 9 tutors, most of whom were first-year students.

Tutors were trained in two capacities: technologies and consultation skills. Tutors were asked to complete faculty-generated digital assignments themselves, so they could better understand faculty expectations, as well as to produce content for a Digital Studio website. Tutors with more digital experience mentored less experienced tutors in a shadowing program. In addition to the technology training, tutors also received training on professionalism, interpersonal communication, and consulting techniques to prepare them for their work with students.

Tutoring was offered to all students enrolled in courses taught by faculty participating in the Digital Literacies Initiative. Some faculty chose to require tutoring as a part of the classroom assignment, while others decided to make tutoring from the Digital Studio optional. Digital Studio tutors worked with students on a variety of digital projects, including scientific research posters, infographics, instructional and creative videos, podcasts, brochures, pamphlets, websites and slideshow presentations. In each of these project formats, students had opportunities to develop both content knowledge and digital literacies.

To gauge the success of the Digital Studio from the perspective of these student visitors, tutors collected survey data from 502 students (74% return rate) using an online survey tool. Students were asked to rate their session, whether they would return for tutoring, whether they would recommend the Digital Studio to a friend, and to what extent the tutor helped them achieve their goals for the assignment. The results suggest that the Studio is a valuable resource for students who need support for their digital literacy development. While fewer than 25% of students actually took advantage of the Digital Studio, students recognized the value once they had an appointment with a tutor. 93% of student visitors rated their sessions as "excellent" or "very good," and 90% would return to the Digital Studio in the future. An even higher percentage of those surveyed would recommend the Digital Studio to others (95%). When asked to what extent the tutors helped students achieve their goals for the session, 89% selected "very much."

In addition to assessing the value of the tutoring experience in the Studio, CTLE also assessed the extent to which students valued the digital assignment as a learning tool within their courses. In the first year, sixty-three (63) students completed an end-of-course survey distributed by Institutional Research (27% return rate). When asked to what extent their digital literacy skills improved, 81% of students claimed their digital literacy skills had improved as a result of the project. Sixty-nine (69)% of students claimed the digital assignment contributed to their learning in the class.

Since 2015, the Digital Studio has opened its doors to all campus students. The Studio's tutors have served well over 1,500 students, and over 30 faculty have worked with CTLE and the Digital Studio to develop authentic digital literacy assignments and associated pedagogical materials. Faculty not only have created new assignments through their work with CTLE and the Digital Studio, but also have revised existing materials to create more authentic assignments intended to develop students' content knowledge and digital literacies. Each of the case studies presented below focuses on the process of revising an existing assignment with a traditional deliverable to provide more authentic opportunities for student engagement.

## AUTHENTIC ENGAGEMENT THROUGH DIGITAL LITERACIES

The implementation of digital projects provides faculty across the disciplines with authentic opportunities for student engagement. Authenticity can be framed as an attribute both of pedagogical tasks and pedagogical materials (Johnson, 2016; Eyler, 2018). Authentic pedagogical tasks are the genuine processes in which students engage with the content of the course. As one example, research scientists in the workforce design their research methodologies, conduct research, analyze their results, and develop technical reports, posters, and other digital genres in order to communicate their STEM content to a variety of audiences, from laypersons to experts in their respective fields. An instructor who creates an authentic pedagogical task would seek to engage students in the processes of *design, analysis*, and t*echnical communication.* The purpose of creating authentic pedagogical tasks for students is to replicate, in significant ways, the authentic professional environments that students will encounter upon entering the workforce.

When framing authenticity as an attribute of pedagogical materials, learning materials and the content of a course are drawn from the real world, as opposed to those materials created and delivered in a format prepared specifically for a particular student demographic (Johnson, 2016). For many of the digital assignments created under the Digital Literacies Initiative, faculty rely on these real-world materials to persuade students of their currency in their respective fields. When teaching the genre of technical lab reports, for example, instructors can draw on authentic examples of lab reports to illustrate the genre, determine generic conventions, and model productively for students how genres function in disciplinary communities.

In an exploration of authenticity, Eyler explains that "learning is embedded in a domain-specific context" (2018). For students, whether they are flying a simulator or jet hardly matters, as long as the brain registers the experience as being "real." His example of a student flying in a "simulator or jet" is particularly apt, given the domain-specific context in which the students at the researchers' campus operate. It is worth considering what is meant by real, however. While the goal of an authentic pedagogical activity is to simulate reality, a certain amount of "cognitive authenticity" is needed for the suspension of disbelief necessary to fully realize that reality and engage students in deep learning.

Digital literacies projects are immersive, often collaborative, and engage students in the production of authentic digital artifacts that often will be a part of their working lives after graduation. Perhaps their greatest benefit is that these projects are diametrically opposed to the inauthentic experience of sitting through a lecture, which as Eyler points out, has long been found "to be ineffective means for engendering student learning" (2019). He goes on to argue his belief that this is primarily because of the lecture's inauthenticity as a pedagogical task. Instead, digital literacies projects are often complex, audience-centered activities that require students to engage deeply in a number of higher-order learning tasks to be successful.

Authenticity, therefore, can be thought of as a continuum. A more authentic task would be work done in a real environment, with a specific audience, and operating within a context in which the result of the work has implications for the student beyond a grade on an assignment. As this pure level of authenticity is only sometimes somewhat achievable through an educational context, educators must instead rely on creating opportunities for cognitive authenticity as they plan learning experiences for students.

What authentic pedagogical tasks and materials can be leveraged in the classroom to fully engage students in deep learning? Researchers have identified ten characteristics of authentic activities (Herrington et al, 2002):

1. Real-world relevance
2. Ill-defined parameters
3. Complexity
4. Allow for multiple perspectives
5. Opportunities for collaboration
6. Opportunities for reflection
7. Cross-disciplinary
8. Real-word assessment
9. Create polished products
10. Allow for diversity of outcomes

Digital literacies afford instructors opportunities to engage students in authentic activities that encompass many combinations of these characteristics, as the examples below will show. The following faculty assignments employ a number of Lombardi's criteria for authentic learning and serve as exemplars for instructors who seek to engage students using digital literacies.

## CONDUCTING AUTHENTIC GENRE AND AUDIENCE ANALYSIS IN TECHNICAL REPORT WRITING

### Assignment Development

In Spring 2018, Alex Watkins designed an assignment for Technical Report Writing intended to make students familiar with some fundamentals of website design, design principles and their role in technical communication, and the genre of technical reports. Through the Digital Literacies Initiative, Watkins redesigned an existing white paper genre analysis assignment to incorporate a website deliverable with a heavier focus on data visualization. The basic assignment concept asked students to analyze technical reports in their field to produce more effective technical reports later in the semester.

In the redesigned assignment, student groups analyzed technical reports in their shared discipline over four weeks in Spring 2018, and three weeks in Fall 2018. During this period, students developed team goals, created internal group schedules, and were provided class time to collaborate to create the final deliverable. Watkins provided minimal intervention in the form of lecture or structured classroom activities, but did provide resources in the form of readings, rubrics, and samples that students could use to create their own sites. Instruction primarily consisted of answering questions and individual group conferences. The goal was to mimic the fluidity and flexibility of the independent, collaborative, problem-based environment that many of the students in the STEM disciplines will face in their future.

### Faculty Development Support

CTLE and the Digital Studio Director designed the Digital Literacies Initiative with a focus on practicality and building a community of instructors who value digital literacies. The group discussed several best practices and resources for designing and assessing digital deliverables in the first meeting to guide the redesign and received feedback on the redesigned assignment from a Digital Studio student tutor. The feedback from the tutor was invaluable regarding scheduling and clarity of assignment parameters. During the second meeting, initiative participants shared their redesigned projects and provided feedback on the assignment. This collaboration and feedback allowed for a practical, practicable assignment in the classroom.

### Role of Authenticity

Students began by planning their group's collaboration. Subsequently, students used the school library resources to identify technical reports in their fields and received some guidance regarding how to analyze the reports for audience, author credibility, purpose, content, writing style, and document design. The groups then developed a website to present their findings to students in their major. The goal of the assignment was to establish students' understanding of the genre of technical report writing, improve and encourage effective collaboration, demonstrate the importance of understanding genre and its influence on audience expectations, and develop students' knowledge of effective design principles and use of data visualization. The assignment was consistent with several of the hallmarks of authentic assignments as defined by Herrington et al. (2002) namely:

- Students investigated the genre of technical reports in their discipline as the first education on the technical report provided in the class to encourage *complex* and *reflective* engagement without instructional framing
- Parameters for the assignment were *flexible*, within some minor guidance regarding genre analysis
- Students planned and participated in productive, self-directed *collaborations*, which helped them engage with the genre more thoroughly and find authentic relevance in their task
- Using what-you-see-is-what-you-get (WYSIWYG) editors, students developed *polished deliverables* of real-world examples of technical reports in their discipline.

The goal of incorporating the authentic assignment was to mimic workplaces. When introducing the project, Watkins provided basic instructions, but indicated that in the business environment, employers would be unlikely to provide exact and specific directions for each individual task. The example used in class was that students, as future employees, might be asked to conduct research and deliver a report on their findings to their boss or colleagues. Therefore, the authentic assignment gave transferable planning and collaboration skills that students can employ in their future projects.

## Digital Studio Support

The Digital Studio was a vital component of students' success in the website project. Because the parameters were deliberately vague and students had the opportunity to make their own schedules, some students incorporated Digital Studio meetings into their schedule. Watkins encouraged students to seek out assistance from the Digital Studio so that they could receive necessary support for working with the digital tools and developing digital literacies in an interactive, one-on-one setting, in line with best practices in the research (Bancroft, 2016). A small amount of extra credit was provided for one meeting; however, many students chose to return to the Digital Studio for multiple appointments during the project.

Students who attended the Digital Studio performed significantly better on the final website than those who did not, even without the extra credit opportunity. Those students who took advantage of the opportunity included more interactive elements, produced more sophisticated data visualizations, and generally had a better understanding of the website genre. According to Watkins, students often reported back about their authentic conversations about digital products, best practices, and future applications of the skills they learned in the Digital Studio. Of those who did not attend the Digital Studio, some groups turned in text-heavy or unpolished deliverables, while these issues were not present in the student groups that engaged with Digital Studio tutors.

Based on student evaluations, most students valued their experiences in the Digital Studio and would use the services again. For both semesters, only approximately 6% of students indicated that they would not use the Digital Studio again (6.25% in Spring 2018, and 6.35% in Fall 2018). Seeing the value of the Digital Studio in Spring 2018, Watkins strongly encouraged Digital Studio attendance in Fall 2018, and the percentage of students who did not attend the Digital Studio dropped from 31.25% in Spring 2018 to 17.46% in Fall 2018, which correlated with overall higher grades on the website project in Fall 2018 on document design scores. Further, 45.35% of students in Spring 2018 indicated they strongly agreed or agreed that the Digital Studio improved their projects, whereas 52.38% of students in Fall 2018 indicated the same improvements.

## Assessment of Digital Literacies

Supporting authentic engagement through website development has been the most successful component of the project. In their end-of-course evaluations, students cited the importance of digital projects and their digital competencies in the future:

- “The world is going digital, so should the classroom. I think it’s a very good tool to learn.
- “These type of assignments are what we will be completing in our future jobs, so its [sic] helpful in preparing us for our future tasks.”

These responses showed that students understood the relevance and real-world applications of their burgeoning digital literacies. Further, as indicated in *Figure 2*, approximately 84% of students in Spring 2018 and 83% of students in Fall 2018 felt that they had improved their digital literacy as a result of the assignment.

In addition, most students felt as if the integration of the website project improved their learning in the course (70.29% in Spring 2018; 73.01% in Fall 2018).

The more challenging component of establishing authenticity is achieved when students value the digital deliverable they created and grasp the importance of the genre analysis component of the writing process. As indicated above, while the overall perception of the project is positive, the website project is also the most commonly cited issue in response to the student evaluation question: “What elements in the course LEAST helped you learn the course content?” Students responded relatively infrequently to this question, but of those students who did respond (Spring 2018, $n$ =35, 54.7%; Fall 2018, $n$ = 34, 53.1%), approximately 25% ($n$ =17) indicated that the website was least helpful. Student comments tended to include three primary critiques:

- Devaluing the analysis and analytical products developed through the website compared with direct instruction (e.g., “The website assignment was not benificial (sic) at all. I appreciate how the professor was thrilled to add an engineering based assignment to the course, but I do not think it was effective for my group members nor I. I wish we could have used that time to start our reports.”)
- Focusing on design, rather than developing content knowledge (e.g., “I” personally did not get much from the website assignment. It was good to understand what tech reports consist of, but I feel like we focused more on just creating a good looking website.”
- Developing limited knowledge because of unequal or ineffective collaboration practices (e.g., “The group website. I only focused on my part, which hindered my ability to evaluate overall key components of tech reports in my field.”)

Overall, much of the critique seemed to stem from students’ discomfort with relying on the knowledge that they produced during the project and potential discomfort with more fluid, less directive assignments. Additional opportunities to engage in authentic learning might develop these competencies and confidence to allow students to rely on their self-generated knowledge.

Despite the critique from some students, Watkins noted a significant improvement in genre awareness for technical reports. In previous semesters, students turned in final reports that had significant genre issues—namely, not relying on data, making an argument rather than analyzing, and devaluing

*Figure 2. Student perception of digital literacy skill improvement*

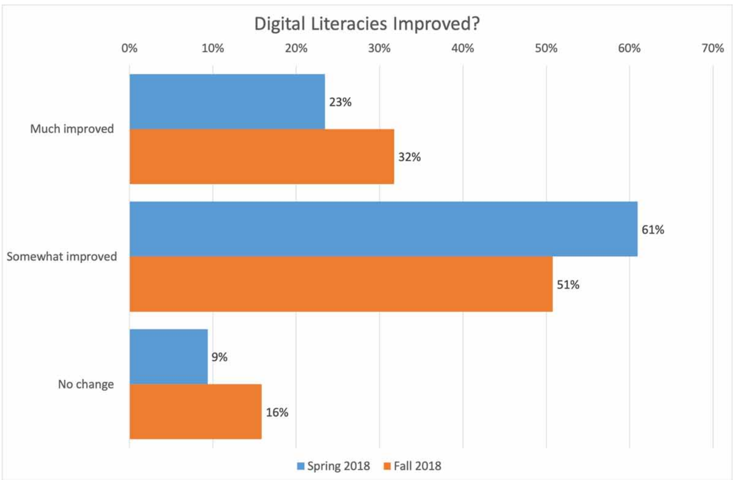
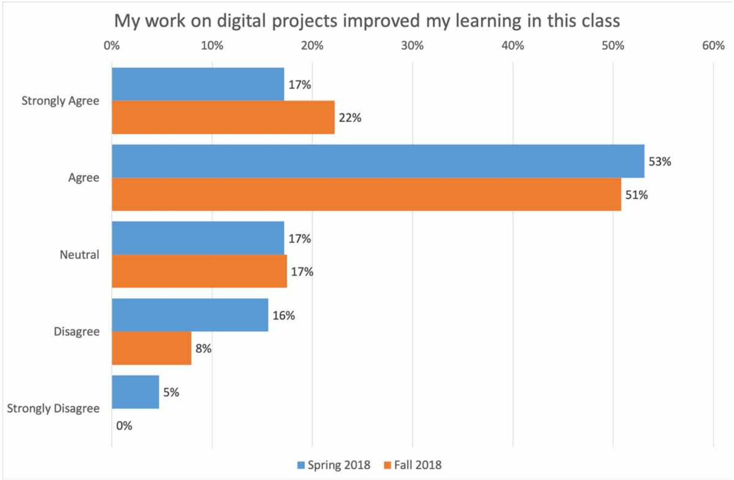



*Figure 3. Student perception of improved learning*




the importance of data visualization and document design. After the website project, some students still struggled with data and citation, but the number of students who simply did not include data visualizations, despite assignment requirements, significantly dropped. Moreover, students were less likely to rely on a set template for document design (i.e., APA); instead, they made decisions in accordance with the principles of design introduced in the website project. Therefore, although students had discomfort with the authentic assignment hallmarks, students did have significant progress in developing the three cornerstones of digital literacy indicated by Matrix, Hodson, and Hodson (2014), developing information literacy through genre analysis, visual literacy by making informed decisions about design and data visualization, and technical fluency through interacting with website editing software. Each of these skills contributed to students' development of digital literacies, as evidenced by their final deliverables.

## MAKING AUTHENTIC CONNECTIONS THROUGH SOCIAL JUSTICE PODCASTS

### Assignment Development

Aaron Clevenger sought to redesign an assignment in a first-year honors seminar on social justice and social change. Clevenger initially asked students to research a social justice topic and create a social media campaign that included a call to action. While the purpose of the course was to teach social justice and social change, students focused on the marketing aspect of social media rather than on utilizing social media platforms as a tool to educate others on social justice topics. An end of course survey confirmed that more than 50% of the students found the assignment and the course to be more about building a social media campaign than social justice. In response to students' comments, Clevenger joined the Digital Literacies Initiative to redesign the social change campaign to be a more authentic assignment. As a result of participation in this program, Clevenger developed a digital assignment asking students to design a podcast series. The assignment was redesigned to allow students to create a digital literacies artifact that combined social justice content with the use of the digital tools through which students could comprehend the real-world relevance of the project. This new digital literacy assignment facilitated learning from factual to metacognitive levels by engaging students in studying a social justice topic of their choice.

Students noted that the design of the social media campaign lacked authentic context and required learning outcomes to be discussed in more detail. Lombardi (2007) explained why this behavior occurs when warning that, in an absence of authentic context, learners will either reject new knowledge or will revert to using the knowledge in a familiar way: "Learners look for connections. When we approach a subject for the first time, we immediately try to perceive the relevance of the new concept to our lived experience. When a new piece of information simply doesn't fit in any of our existing knowledge structures (or "schemas"), it is often rejected. This means that the more encouragement a learner has to become invested in material on a personal level, the easier it will be to assimilate the unfamiliar" (Lombardi, 2007, p. 8). To help students make authentic connections to the project, Clevenger developed several scaffolding opportunities. Students were assigned to review Anderson's (2011) work and were prompted to reflect on how storytelling in a manner such as podcasting might have an authentic relevance to their future. In addition, Smith's (2012) foreword to Baillie, Pawley, and Riley (2012) was used as a resource for a course discussion on the importance of social justice in the field of engineering, especially in consideration of engineering's impact on the environmental, societal, and political outcomes of a region and its influence on the economy.

#### Literature Review and PowerPoint Presentation

During the last few weeks of the course, students were assigned a literature review and an annotated bibliography on one of 24 social justice topics, including poverty, water usage, genocide, the impact of war, and climate change, among others. Upon the completion of the literature review, the class was divided into groups of three. Each group chose one group member's literature review to use as the basis for a 20-minute presentation on the chosen social justice topic. The presentation included the following:

- A brief synopsis of the social justice topic, including a definition (e.g., homelessness)
- A definition of important terms

- Identification of any subcategories of problems--What are they, and how are they distinguishable? (e.g., in homelessness, there is episodic homelessness, short-term homelessness, and long-term homelessness; in addition, there are issues related to homelessness in children)
- Documentation of the injustices that have and/or are occurring related to this topic (e.g., lack of education for the homeless, lack of jobs, mental illness, lack of health care etc.)
- Proof that this is a problem (statistics, research, mentions in popular media)
- A brief history of the topic including what experts believe is the root cause of this issue, both historically and in present day
- An explanation of ways that society has dealt with the topic (i.e. homeless shelters, work programs, laws against the homeless, etc.)
- Consequences and impacts the social injustice has on individuals and society as a whole

### Storyboarding and Scripting

The 20-minute presentation was then used as a basis for the next portion of the assignment: the storyboarding and outlining of three different scripts for each of the three assigned podcasts.

Podcast 1: Student groups reconstructed their 20-minute research slideshow presentation into an 8-10 minute podcast, providing background, context, and facts about their social justice topic.

Podcast 2: In a second podcast of the same length, groups continued their conversation about their social justice topic. Within the second podcast, groups focused on changes needed to fight the social injustice. Students utilized concepts from Sensoy & DiAngelo's (2007) textbook *Is Everyone Really Equal* to inform possible social justice concerns and issues that must be addressed in order to achieve social change.

Podcast 3: In the final 8-10 min podcast, groups concluded their series with a positive story about change in action. As an example, if homelessness was the topic, a group identified and discussed a successful soup kitchen or a town's anti-poverty program. Groups were required to interview someone live on their podcast (allowing each team member to ask questions).

Students were given several class periods to storyboard (design the layout). Students were also encouraged to become familiar enough about their chosen social justice topic that they could speak conversationally within the podcast; this speaking style would provide smoother transitions among the three group members while also meeting the assignment parameters.

## Faculty Development Support

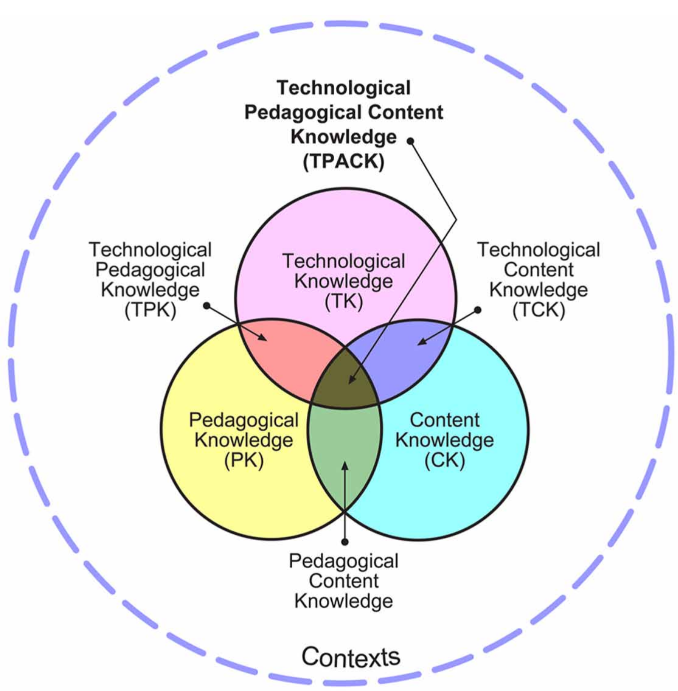
CTLE provided Clevenger and other pilot faculty with Mishra and Koehler's (2006) TPCK framework to facilitate student engagement with the content of the course, the digital technologies in use, and the development of digital literacies. Technological pedagogical content knowledge (TPCK) is an emergent form of knowledge that goes beyond all three components (content, pedagogy, and technology). This knowledge is different from disciplinary knowledge and general pedagogical knowledge shared by teachers across disciplines. Mishra and Koehler explain that the TPCK model "is the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones" (2006, pp. 1028-29). To these ends, Clevenger was able to consider the intersected learning that should occur when designing an assignment to give equal weight to pedagogical content, and technological knowledge (See *Figure 4*).

## Digital Studio Support

Students were provided time out of the classroom to visit the Digital Studio for digital literacies development. Tutors aided students in transforming their storyboards into a podcast. Assignment instructions required that the final podcast include a musical opening, as well as an introduction of the presenters, the course, and the social justice topic. Further, the assignment required a voice-recorded monologue of all three group participants, vocal and musical segues between points, and both introductory and closing remarks.

Utilizing scripted storyboards, voice recordings, and copyright free or fair use music samples, the students, with the assistance of the Digital Studio tutors, mixed the audio together to form a final podcast. Each group was given the autonomy to use the recording hardware and software of their choice, though groups used either Audacity or Garage Band to produce their .mp3 or .mp4 audio file. One example of a final product by Bulger, Gain, & Spolar (2015) can be found at (https://commons.erau.edu/db-honors-social-justice/1/).

*Figure 4. Reproduced by permission of the publisher, © 2012 by tpack.org*
*(Koehler, 2017)*



## Assessment

Over the course of the three podcasts, the students developed competencies that allowed them to rely less on the Digital Studio than when they began the class. When comparing the social media assignment and the social change podcast assignment, the course developer noted tremendous improvement in the students' social justice and social change awareness, as indicated in Table 1:

In Clevenger's case, a digital literacies assignment was implemented to solve a pedagogical problem and did so through multilayering digital literacy opportunities as Martin (2008) describes. In one assignment, Clevenger asks students to develop a number of digital literacies: technological literacy, information literacy, and aural literacy. To support these efforts, the professor worked on improving scaffolding efforts, making more clear the assignment instructions and detailed rubrics, which helped shift the focus from student engagement with technologies for their own sake, to the ways in which technologies facilitate activist opportunities for social justice. Combining several of Lombardi's characteristics of authentic learning (real-world relevance, complexity, opportunities for collaboration, and create polished products), Clevenger's podcast series proved successful in helping students to make connections in authentic ways and contributed to improvements in student engagement.

# COMMUNICATING STEM CONTENT IN AUTHENTIC WAYS

## Assignment Descriptions

Emily Faulconer included digital literacies into a lecture and laboratory for General Chemistry I. In the lecture, Faulconer designed a project, "Chemistry in the Real World," which asked students to work individually on a project connecting their learning in the course to real-world chemistry. The overarching goal was to cultivate interest in science that would continue beyond the course. In addition, the assignment

*Table 1. Survey result comparison*

| | Social Media Campaign (n=12) | Digital Literacies Podcast (n=16) |
|---|---|---|
| **Describe the main purpose of the assignment.** | | |
| To teach the basics of a social media campaign/podcast | 50% | 0% |
| To introduce the basic concepts of social justice | 25% | 28% |
| To teach about the specific social justice topic studied | 25% | 71% |
| **How aware were you of the social change process regarding your social justice topic?** | | |
| Somewhat aware | 33% | 14% |
| Aware | 33% | 29% |
| Extremely aware | 33% | 52% |
| **How aware were you of the importance of your social justice topic having a real-world impact?** | | |
| Somewhat aware | 17% | 0% |
| Aware | 33% | 28% |
| Extremely aware | 50% | 71% |

supported the following key skills: 1) to bridge concepts to applications, 2) to communicate scientific content accurately for lay or peer audiences, 3) to appreciate the socially, ethically, and environmentally responsible use of chemical knowledge, and 4) to make decisions based on scientific information.

The deliverables for “Chemistry in the Real World” included the development of a project description, key vocabulary, clear connections to the learning objectives, and references. However, the activities and deliverables for the project were student-designed. Some instructor suggestions were to attend scientific talks, to reflect on current events, to critique a recent journal article, to conduct an interview, and to participate in chemistry-related volunteer work (like water quality monitoring). Students could also propose their own project. Common deliverables designed by the students were journal reflections, videos, podcasts, narrated slides, and infographics. A standard research report, in this case, was not a permissible deliverable.

In Faulconer’s laboratory course, the standard formal laboratory report was modified to reflect authentic scientific writing and publishing. Students collaborated in teams of two, with one student serving as the Principal Investigator, responsible for quality control and submission of the work. While a standard laboratory report typically includes materials, methods, results, and discussion, this deliverable was modified to reflect a scientific manuscript, including a literature review and works cited with at least 10 scholarly resources. Students were expected to properly evaluate sources for reliability, author credibility, and currency.

To enhance collaboration, provide a variety of perspectives, arrive at a polished final product, and further align with the authentic scientific process, students submitted their work for open peer review through the learning management system. This rough draft was worth 5% of their course grade. The final draft of the formal report, submitted online, was worth 10% of their overall course grade, with their grades reported both with a numerical grade and an editorial decision of accept, accept with major revisions, accept with minor revisions, or reject. With this modification of a standard assignment, the laboratory assignment attained real-world relevance.

Graphical abstracts are being used by many scientific research journals, in addition to the traditional text abstract, to make the review of literature more visual and engaging for readers. A graphical abstract is a single visual summary of the core of the paper, or key takeaway. The image must be simple, informative, and engaging. Because graphical abstracts are used for online publication of an article as opposed to print, the use of color is encouraged. Text is very limited in a graphical abstract. While the graphical abstract can be a key graph or figure from the article itself, often it is a new construct to communicate the message of the work.

Graphical abstracts were required in student reports to reflect the changing nature of scientific publication and infuse digital literacies into the course. The graphical abstract was worth 10% of the grade for the laboratory report. The graphical abstract had a separate scoring sheet that provided detailed expectations. Students were presented several types of graphical abstracts with multiple examples of each category from authentic research. The strengths and weaknesses for each were discussed. Several examples of high-quality graphical abstracts are presented in *Figure 5 and Figure 6.*

## Faculty Development and Digital Studio Support

The Digital Literacies Workshop offered by CTLE offered essential support for the embedding of digital literacy skills into the Chemistry course. The workshop established the instructor’s background knowledge on digital literacies and provided peer review of proposed project instructions and rubrics.

*Figure 5. Graphical abstract reprinted with permission from Kurushkin, M. & Tracey, C. (2019) Introducing electron probability density to high school students using a spiral drawing toy. Journal of Chemical Education, doi: 10.1021/acs.jchemed.8b00391. (© 2019, American Chemical Society)*

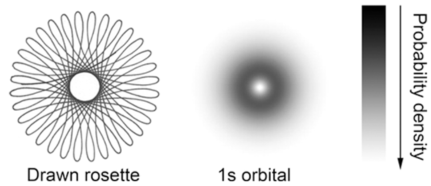
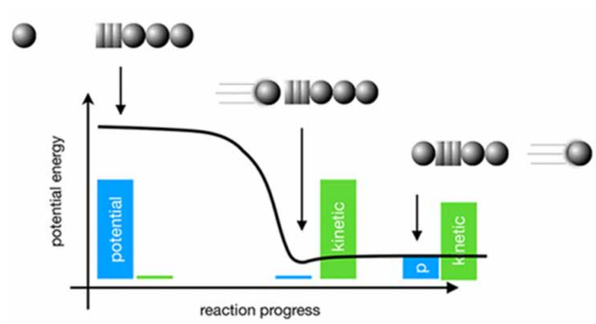



*Figure 6. Graphical abstract reprinted with permission from Elliott, L.A., Sippola, E., & Watkins, J. (2019) Modeling chemical reactions with the gaussian gun. Journal of Chemical Education, 96(1), 100-103. doi: 10.1021/acs.jchemed.8b00709 (© 2019, American Chemical Society)*



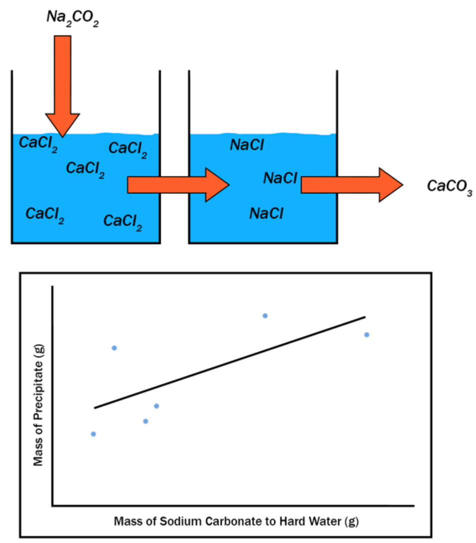

Post-workshop, Faulconer met several times with CTLE staff to develop and refine the assignments and accompanying rubrics.

For Faulconer's assignments, students were not required to use the Digital Studio. However, the resource was advertised to students as support for their development of graphical abstracts, infographics, and other digital deliverables. While several students utilized the Digital Studio for the development of infographics, no students used the Digital Studio for their graphical abstracts. Regardless, most teams arrived at a high quality graphical abstract to represent their work, with an average score of 8.2 out of 10 points. A student submission is presented in *Figure 7*.

The student's formal laboratory report was prepared based on data they obtained in the inquiry lab on water softeners. They adhered to the basic formatting of a graphical abstract by using a high-quality, simple, organized image to convey a take-home message of the paper. Their image shows how adding sodium carbonate to the hard water forms sodium chloride and precipitates calcium carbonate. The image also shows how increasing the mass of sodium carbonate increases the mass of chalk precipitated from the hard water. They minimized the use of text, only using text for key labels in the image. The graphical abstract was original work, created by the students.

Despite Bancroft's (2016) advice that learners need digital literacy instruction with personalized support, students often will not seek out digital literacy instruction because of assumptions that technology use equates to digital literacy. These skills are not easily transferred. In addition, there are several possible reasons why the Digital Studio was not utilized by more of Faulconer's students. The Digital

*Figure 7. Example of student-generated graphical abstract*




Studio was a new tutoring space on campus, and many students may have been unfamiliar with it as a potential resource. Second, Faulconer did not require use of the Digital Studio, so students may not have perceived it as an ideal use of their time. Finally, the hours of the Digital Studio, which was in pilot mode and hosted limited hours, may not have aligned with student schedules. Because the students who *did* use the Digital Studio found it useful, and those students who used the studio tended to generate very high-quality deliverables, it could be that a larger marketing campaign to inform students of the purpose and benefits of the Digital Studio would have driven use. Furthermore, allowing for online submissions and feedback could have also expanded its use by removing scheduling as a barrier.

## Assessment

Faulconer's digital literacy assignments for "Chemistry in the Real World" were designed specifically with authenticity in mind and take advantage of several of Lombardi's characteristics of authenticity, including real-world relevance, ill-defined parameters, complexity, allowing for multiple perspectives, opportunities for collaboration, real world assessment, and creating polished products. Because of the strength of the assignment development, students succeeded despite not taking advantage of an important campus resource in the Digital Studio. In summary, the instructor determined that these assignments allowed students to demonstrate mastery of a number of digital literacies, including visual, digital, design, collaboration, and research, important digital literacy skills that students need in "an increasingly visual culture" (Matrix, Hodson, & Hodson 2014).

## RECOMMENDATIONS AND CONCLUSION

The Digital Literacies Initiative developed in response to faculty concerns about students' abilities to effectively communicate highly technical content once they enter the workforce. It has grown from a pilot effort with 7 faculty to over 30 faculty and 1500 students having engaged in digital literacy development at this STEM-focused institution. The experiences of 3 faculty members represented in this chapter have elicited a number of best practices needed to facilitate student engagement:

1. *Assessment should drive development, growth, and maintenance*: The researchers surveyed faculty to determine the extent to which they had concerns about students' development of digital literacies. These data points were persuasive when seeking internal funding from our Provost's office to fund a tutoring space for students. Ongoing assessment of student perceptions of digital literacy acquisition on end-of-course evaluations, tutoring session satisfaction surveys, and faculty focus groups have provided the campus with important information that has helped to identify needs in terms of software and hardware, technology access, faculty development, and other support structures.
2. *Collaborate with your Information Technology (IT) unit on campus*: Identifying software and hardware needs was a crucial first step to developing the Digital Studio. In the absence of a tutoring space, IT can help to identify what resources exist on campus to support students. For example, the campus did not have any Apple technologies available in computer labs and had very few Mac computers on campus at all. Given the fact that many of our students were bringing their Apple products to campus (phones, tablets, laptops, and desktops), the researchers determined these would be needed to facilitate student work on these assignments. In addition, IT staff were crucial in suggesting cost-friendly options for multimedia products. Not all students can afford high-end movie editing software, so options had to be made available to account for a range of products.
3. *Engage with faculty developers to improve teaching materials*: To avoid falling into add "add technology and stir" approach, faculty should instead rely on the expertise of instructional technologists and faculty development teams on campus to guide efforts. In the absence of these important experts who can balance technology and pedagogical concerns, campuses often have faculty who regularly engage students in digital literacy development, such as faculty who teach public relations, visual design, technical report, and other communication/technology courses. These faculty can help guide assignment revisions, rubric development, and teaching techniques.
4. *Create authentic assignments to facilitate deeper student engagement and learning*: As the above assignments illustrate, digital literacy assignments engage students when they are authentic. Digital literacies projects can engage students authentic activities such collaborating in small groups, developing authentic disciplinary genres, creating polished products, and engaging in real-world relevant tasks. The benefits of these literacies are easily understood by administrators, faculty, and students alike in terms of workforce development.
5. *Encourage collaborative assignments to allow students to contribute to and learn from one another*: Many students suffer from the digital divide that separates those that come to our campus with experience and access to digital technologies from those that have not grown up with this same opportunity. Therefore, students in a class will have a range of skills across technologies. If digital literacy assignments are created as group projects, faculty are providing students the opportunities to share knowledge and cross-train one another on digital literacies.

6. *Engage the broader campus community*: To promote the work of the Digital Literacies Initiative, an Open House advertised the work of the Digital Studio and encouraged the campus to think broadly about how digital literacies inhabit the work of faculty, staff, and students. Both the university's President and CIO spoke about the importance of digital literacies in workforce development. In addition, Digital Studio tutors were on hand to engage visitors with the technologies in the room in small activities, such as photo editing and greenscreen filming. In addition, a Student Innovation Awards program was launched that required students to submit their ideas in two digital literacy genres: short films and research posters. This award opportunity advertised broadly to students about the availability of the Digital Studio and its important role in developing students' digital literacies outside of curricular efforts.
7. *Encourage faculty to develop their own digital literacies*: Ideally, faculty would create the digital literacy assignment themselves before piloting the assignment with students. While CTLE did not engage faculty in an activity like this, one faculty member chose to create a podcast in advance of developing the details and rubric for the assignment. Having faculty grapple with their own digital literacy development allows them to identify with the tasks they are asking of students. In addition, campuses can encourage faculty to improve their own digital literacies for their own sake. Multimedia literacies are becoming more and more a part of academics' professional lives. Knowing how to create an effectively designed scientific/research poster is a useful set of digital literacies for our STEM faculty to develop, while creating an effective, readable slideshow presentation is a useful set of skills for any faculty member to develop.
8. *Remain focused on digital literacies as opposed to digital technologies*: From the outset of this initiative, the researchers maintained that literacy development was more important than teaching software and hardware skills. Because technologies change with lightning speed, skills such as visual design, aural design, information architecture, and the like are transferable across technological contexts. Assignments that maintain focus on the development of literacies facilitate transfer of these literacies by students to any new technology that may be developed in the future.

The assignments and best practices presented in this chapter demonstrate not only a full range of Bawden's (2008) six central digital literacy competencies, but also the value of digital literacies in creating authentic assignment opportunities for students across the disciplines. Additionally, the partnerships developed between faculty, the Center for Teaching and Learning Excellence, Information Technology, and the Digital Studio demonstrate that, with appropriate resources, professors are empowered to include non-traditional, digital media assignments in the classroom. Students are also supported in the development of the digital literacy skills necessary to produce effective digital media artifacts.

Working with professors across the disciplines to develop and engage students' digital literacy skills allowed the researchers to develop best practices for the inclusion of digital literacy projects in course curricula. These best practices focus on developing and maintaining a support structure for both professors and students, as well as for developing authentic digital literacies project opportunities across the curriculum.

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## KEY TERMS AND DEFINITIONS

**Authentic Engagement:** Learning opportunities for students that focus on a range of real-world problems, activities, experiences, and communities with the goal of students developing deep learning that transfers across a variety of contexts.

**Digital Divide:** A technological gap between those with access to and experiences with digital technologies, and those who lack access to technologies, bandwidth, instruction on usage, and other limiting factors.

**Digital Literacies:** A measure of the skills needed to use, evaluate, adapt, and create artifacts in digital environments.

**Graphical Abstract:** A simple, self-explanatory visual summary of the overall message of a research article, designed to attract readers and help them quickly identify the relevance to their research interests.

**Podcast:** Digital audio or video files that are made available to download, usually presented in a series.

## ENDNOTE

[1] Bancroft bases her conclusions on a review of the following scholars: Anderson & May, 2010; Corso & Devine, 2013; Mitchell & Soini, 2014; Pendell at al., 2013; Relles &Tierney, 2013; and Tout et al., 2013.

# Chapter 8
# Designing Engaging Assessments for Teaching the Digital Humanities

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## ABSTRACT

*Humanities are pertinent to the digital culture of today. This chapter details how non-Humanities students are engaged in "Digital Humanities: From Text to txt," a team taught, multidisciplinary course offered at the University of Auckland since 2016. Engagement across five Humanities disciplines—Art History, English Literature, History, Philosophy, and Religious Studies—is unified with the common theme of the "digital turn." The course is modular with each discipline given a two-week block in a twelve-week semester. Students learn with and about technologies through a range of digital forms of engagement encountered in the Humanities. The course builds on students' digital curiosity to revisit questions of personal identity, ethics and belief, meaning, creativity, and historical understanding. Engagement begins in the lecture and tutorial and is deepened via five short assessments and an online final examination. Over the two iterations of the course, student satisfaction and pass rate was high and enrolments increased by 20%.*



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## INTRODUCTION

### Humanities and the "Digital Turn"

The broad array of disciplines identified as the Humanities have engaged questions of artistic and literary creativity, forms of critical judgment and rationality, religious and philosophical traditions, and enduring questions of historical interpretation and identity. The originating questions and practices of the Humanities thus date back several centuries; yet the Humanities are also essential to the mobile, digital, data- and media-intensive culture of today. Scholars within humanistic traditions have embraced new technologies for both research and teaching and have engaged in a wide-ranging debate over how (or even whether) the humanities should go digital (Berry, 2012; Burdick et. al., 2013; Schreibman et. al, 2016). This chapter details an effort to engage students using technologies in the design and facilitation of "Digital Humanities: From Text to txt," a team taught, multidisciplinary course offered at the University of Auckland since 2016. The main goal of the Digital Humanities course is to *engage* non-Humanities students in the questions, ways of thinking, and objects of study in the Humanities. Engagement is across five *disciplines* - Art History, English Literature, History, Philosophy, and Religious Studies. The course is unified with the common course theme of the "digital turn." Each participating discipline decides how best to illuminate the impact and implications of the new digital methods, approaches, and tools which are then used to engage students in the respective disciplines.

The goal to explicate the political and cultural significance of the Humanities to today's students is clearly outlined in the course syllabus, "*[T]his course offers a 'tasting menu' of what the Humanities look like as they engage with digital instruments and new technologies… [it] is designed to appeal to your curiosity about what it means to be human in the digital age. We hope you will come away from this … with a sense of the communicative and collaborative possibilities of our digital world, and an appreciation for how and why humanistic ways of thinking and doing can enrich our everyday lives and experiences.*"

In the Digital Humanities course, students learn *with* and *about* technologies through a range of digital forms of engagement encountered in the Humanities. The course builds on students' digital curiosity to revisit questions of personal identity, ethics and belief, meaning, creativity, and historical understanding. The structure is modular with each discipline given a two-week block in a twelve-week semester. Engagement begins and is facilitated - through a range of technologies - in the lecture and tutorial and is deepened via five short assessments and an online final examination. The tutorials are crucial to building the connective themes and practices of the course, equip students with additional resources to take beyond the course, and immerse students as disciplinary practitioners (producers as well as consumers of knowledge).

Over the two iterations of the course, student enrolment increased by 20%, as the awareness of this unique course spread across the University. The course also had a high satisfaction and pass rate which can be attributed to well-designed strategies for engaging students in authentic, technology-integrated learning in the disciplines. The course pass rate increased to 90% in its second iteration which is excellent for a General Education course at The University of Auckland. This chapter includes only a selection of instructional technologies core to the engagement and teaching strategies in the Digital Humanities course. To include all the technologies that were students' choice and accommodated in the activities is beyond the scope of this chapter.

### Engagement Strategies using Instructional Technologies

The engagement strategies and the selection of instructional technologies were based on "the toolbox" of a given discipline: its object of study, lines of inquiry, methodologies, and a selection of digital technologies as outlined in Table 1. The core technologies for the entire course, such as the Learning Management System (LMS), readings database (Talis Aspire) and online exam tool, were consistent throughout. While lectures demonstrated the impact of the digital turn on disciplinary knowledge and practice, the weekly tutorials allowed students to connect their knowledge acquisition to practice. The two tutorials devoted to each discipline utilized the disciplinary "toolbox," so a variety of digital technologies supplemented the core course ones.

The tutorials were key to grounding student engagement with the overarching theme of the course and preparing them to complete the assessment component of each module accordingly. The two tutorials for each module followed a consistent pattern. The first focused on discussing expert knowledge shared through lecture and required set readings. Both lecture and readings had a digital dimension or took digital form. Audio lecture recordings were provided through the LMS, and readings appeared in Talis Aspire. Readings provided definitions, key questions, and the methodologies of the given discipline while the recorded lectures provided opportunities for review and catch up. The second tutorial built on this disciplinary knowledge by modeling and applying digital disciplinary practices. This process of experiential learning facilitated student completion of the assessment.

With just a few exceptions, all assessments involved some form of writing, as it is a basic skill required in the Humanities disciplines. Students wrote informal, descriptive tweets, captions for images, and personal reflections as well as formal paragraphs and an essay structured as an argument in response to a prompt. This variety of writing -mediated through technologies - meant the assessment was consistent with the aim of the course of combining old and new educational practices. While the traditional form of assessment in the Humanities—the essay—was reinforced, students could explore other ways to communicate their knowledge and learning, including digitally.

## LITERATURE REVIEW

### Instructional Technology and Higher Education

Educators adopt contemporary instructional technologies to engage students who are ostensible "born digital" or "digital natives." However, the technology landscape evolves rapidly, so research into best practice in education always lags (Adesope & Rud, 2019). Researchers like Prensky (2001) advocate for more technology use in education but others like Selwyn (2016, p. 1006) caution that technological interruptions "seem to diminish students' scholarship."

Technology use in higher education is often criticized for the lack of thought in the selection of appropriate tools, poor pedagogical design, and ineffective or inconsistent implementation across programs. Technology tools themselves do not teach or result in effective or meaningful learning unless properly scaffolded in authentic learning environments (Datt & Aspden, 2011). In the Digital Humanities course, instructional technologies were chosen for their relevance to the specific Humanities discipline and integrated into a diverse array of activities and assessments by which students could engage in, and appreciate, disciplinary differences with the aim of learning authentically through experience.

*Table 1. Summary of disciplinary engagement strategies, instructional technologies and assessment*

| Discipline | Engagement Strategies | Instructional Technologies | | Assessment<br>Continuous 50%<br>Final Exam 50% |
|---|---|---|---|---|
| | | Core tools | Supplementary tools | |
| Religious Studies | Searching for information using Information and Communication Tools (ICTs) to create a project - in the form of a poster, photo essay, video, blog post, podcast, or a traditional essay - on a chosen topic or controversy about an aspect of religion that provoked online debate. | Learning Management System (Canvas)<br>Recorded lectures (streamed or downloadable)<br>Readings<br>(Talis Aspire) | Online forums, social media, blogs, news sites<br>Phone apps | 10%<br>Project equivalent of 350-400 words documenting an online debate on a religious topic or controversy. |
| Philosophy | Reflecting on personal daily engagement with technologies to form a philosophical argument "for or against uploading your life on the internet" structured as a five-paragraph essay. | | Discussion forum<br>Video (movie-Transcendence) | 10%<br>A philosophical argument on whether it is rational or irrational to upload one's mind to the computer. |
| Art History | Using online collections to select, organize and write labels (or captions) for artworks for a virtual exhibition. Practicing formal and contextual analyses of visual sources through case studies: *What Jane Saw.* Analyzing the place of a selfie in modern portraiture. | | PowerPoint, Blogs, Playlists<br>Online museum collections: Rijksmuseum (Netherlands), the Metropolitan Museum of Art (USA), and the Tate Gallery (UK)<br>Content curation websites (e.g. Pinterest, Snapchat, Instagram)<br>Online exhibition 'What Jane Saw' http://www.whatjanesaw.org | 10%<br>Virtual exhibition curating a selection of three artworks that share either a "formal" aspect or a "contextual" similarity. |
| History | Analyzing the democratization of access to existing historical sources stored in archives and depositories. Exploring new bodies of historical sources and new software for visualizing and interpreting "big data." | | Google books<br>Ngram viewer<br>Twitter<br>TV<br>Digital archives | 10%<br>Run two Ngrams, covering different time scales, on an important historical idea or term, and analyze and explain similarities and differences in findings. |
| English Literature | Exploring habits of cultural consumption such as individual immersive experiences, storytelling, programming and playing. Applying critical analysis to computer games. | | Interactive fiction<br>Digital Literature: Shan Shui (2014) and Evolution (2014) | 10%<br>Literary explanation as a poet or multi-media writer of gap function in word generation in *Evolution* or ekphrasis in *Shan Shui* |

## Student Engagement

Engagement - mediated by technologies or not - is a problematic concept to accurately define and infer. Alongside good design frameworks premised on the potential of technologies, valid measures of various types of engagement are also needed (Czerkawski & Lyman, 2016; Dewan, Murshed, & Lin, 2019; Henrie, Halverson, & Graham, 2015). Recent studies (see also Adesope & Rud, 2019; Schindler, Burkholder, Morad, & Marsh, 2017) on student engagement in higher education aim to address shortcomings and improve the practice of technology integration. Schindler et al (2017, p.4) build on the seminal work by early researchers Pace (1980) and Astin (1984) to define engagement as either (1) a desired outcome "reflective of a student's feelings, thoughts, and behaviors about learning"; or (2) as a process involving both student and the university. They contend that variations of the latter definition are more widely used in current models of student engagement. Engagement in the Digital Humanities course was approached in a similar vein and defined as: student time and effort spent on the technology-integrated assessment and activities (process) to learn the ways of the disciplines (learning outcomes).

Levels of engagement are often correlated with learning, albeit with questionable accuracy. More engagement is thought to promote deep learning, while less engagement indicates surface learning (Lock, Kim, Koh, & Wilcox, 2018). The focus for inferring levels of engagement can vary between the influential factors (e.g. institutional or departmental culture, curriculum, pedagogy), indicators (e.g. time on task, peer learning) and/or outcomes of engagement (e.g. academic achievement, professional skills) (Henrie et al., 2015). These foci can be identified at broad levels of institution and/or discipline or narrow levels of course and/or program.

The Digital Humanities course was focused on disciplinary level of engagement. All the activities including assessments were designed to authentically engage students in the ways of the respective discipline, in concordance with Schindler et al.'s (2017) conceptual framework for student engagement. According to Schindler et al., student engagement can be one or a combination of three types - behavioral, emotional and cognitive. Each type has its own indicators to infer the level of engagement achieved, albeit with varying degrees of ease.

Behavioral engagement captures students' *active* involvement in learning activities and its indicators are "observable student actions" (p. 6), such as the time and effort spent to participate in learning activities and interact with peers and teachers. Behavioral engagement, as access and participation in Digital Humanities course activities were detected via objective/automated, time-stamped reports from the LMS. Data on lecture capture, readings, assessments and discussion-based activities were scrutinized. Researchers like Holmes (2018) have demonstrated the relevance of such data for inferring engagement when activities and assessments via the LMS are well designed. For example, the Digital Humanities students were highly engaged with the recorded lectures as these were accessed by almost every student over the twelve-week semester.

The second type of student engagement in Schindler et al.'s framework is emotional, which is based on students' *affective* reactions to learning. Emotional engagement includes attitudes and interests that are often self-reported. The only self-reported data for the Digital Humanities course was collated from the open-ended questions of the Student Evaluation Tool (SET). SET evaluations are conducted for each University of Auckland course through the University's Planning Office and anonymized results are available to the affiliate teachers. Overall, the students were positive about the design and pace of the short assessments as these were manageable and progressively build on knowledge and skills of the discipline. This is consistent with microlearning, a pedagogical strategy for technology integration proposed by Alqurashi (2017). "Microlearning refers to a learning strategy designed using a series of short learning content and short activities" (p.1) that is fit for the short attention span of the human brain.

Finally, the type of engagement that is the hardest to measure is cognitive. Cognitive engagement is the level of *effort* students expend in mastering content. Indicators of cognitive engagement include levels of motivation, persistence and critical thinking. There was some scope to gauge cognitive engagement in the Digital Humanities course. The short assessment on "philosophical argumentation" specifically focused on the development of critical thinking. However, there were limitations as it was not feasible to include the continuum (passive - active - constructive - interactive) that Chi & Wylie (2014) propose for inferring cognitive engagement or conclude on the level of this type of engagement in the whole course.

Overall, levels of engagement were inferred using behavioral and emotional indicators while the outcome of engagement were inferred via achievement in the final exam. Time and resources did not allow for in-depth analysis of cognitive engagement. A decision that can be justified with the fact that most of the students were from non-Humanities background and would not go on to achieve a Humanities qualification.

### Innovative Assessment Strategies for Engagement

The "new assessment culture" in education (Birenbaum 2003, p. 22) encourages university teachers to "assess innovatively" so "that it enhances and enriches students' learning experience" (Race 1999, p. 58). Through a combination of formative and summative assessments, students are supported to engage in their learning process rather than just receive a grade or rank to enable progression (Black & Wiliam, 2018; Brown, Race & Smith 1996; Falchikov 2005).

Each of the five disciplinary modules in the Digital Humanities course had a short assessment component due every two weeks. The aim of these assessments was to allow students to put into practice the knowledge gained in lectures, readings, and tutorial discussions about these traditional Humanities disciplines. The integration of technologies in the assessment tasks meant students gained a keen awareness of the communicative and collaborative possibilities of the digital world for the Humanities. It also enabled students to compare the impact and implications of the digital turn on each of these disciplines. In accordance to Gibbs (1999, p. 47), the teachers were "helping students to internalize the discipline's standards and notions of quality."

## COURSE DESIGN

The pedagogical design of the Digital Humanities course responded to, and grew out of, disciplinary configurations distinctive to the University of Auckland, where the Faculty of Arts is divided into four separate Schools. Auckland's School of Humanities includes six Disciplinary Areas (English, History, Philosophy, Art History, Theology/Religious Studies, and Classics/Ancient History), and the course design relied on collaborative teaching that drew upon existing digital expertise in any or all the academic units within the School. This reliance on freely volunteered expertise meant a highly fluid understanding of "Digital Humanities" and an unusual course configuration - modular rather than sequential - with each discipline given a two-week bloc in a twelve-week semester rather than having interdisciplinary dialogue throughout the semester. The democratic structure was a non-negotiable part of its appeal to administrators and for buy-in from colleagues and was central to constructing teaching relationships across disciplines that would otherwise not appear before the same group of students.

Although this multidisciplinary course and modular structure had many benefits in terms of creativity and feasibility, in its first offer, students had difficulty making links between and among the disciplinary modules. So, in the second iteration, the course convener attended every lecture, provided an introduction and conclusion for each disciplinary module and participating lecturer, and established and reinforced the multiple dimensions of the course theme of the digital turn. Student feedback indicated that this change provided greater continuity across the course, affirming the proposition of Collins et al. (2015) that good communication lines ensure effective course flow in interdisciplinary team teaching. How instructional technologies can be leveraged to achieve continuity in collaborative teaching and student experience is an area of ongoing interest for the course team.

From the outset, it was important to engage pedagogies that promote knowledge transformation rather than transmission, engaging students in the ways of the discipline through experiential learning (Kolb, 1984). Disciplines are now understood as forms of knowledge with key concepts, types of inquiry, and "ways of establishing truth claims" (Wineburg 2001, p. 41) rather than just a set of content or topics. This new thinking about disciplines has made educators adopt types of teaching that "define what counts as knowledge in a field and how things become known" (Shulman 2005, p. 54). It is what Shulman (2005) has termed "signature pedagogies." As signature pedagogues, the Digital Humanities team not only taught disciplinary content for students to achieve a pass, but they also incorporated - with the help of technologies - specific methods and skills to engage students as apprentice practitioners in the discipline.

Each discipline addressed the overall course theme in whatever ways were consonant with the research and teaching interests of participating staff, so the assessment design was receptive to uses of social media, digital preservation and archiving, text-mining and distant reading, data visualization, and ethical and moral reasoning (see Table 1). Teacher preference and digital skills determined the consistency with which instructional technologies were leveraged to implement experiential learning (Schindler et al., 2017).

Teachers also provided incentives to deepen the engagement in both iterations of the course by offering up to three bonus points for optional online activities such as contributions to: 1) student-produced collective glossary of key terms; 2) blog; and 3) Twitter interactions. About a quarter of the students attempted at least one bonus option but this dropped dramatically when the bonus points were reduced to 1% showing that the incentive threshold was far too low.

Even with all things being equal, there is no guarantee that the learning environment and experiences created will engage every learner. Chi and Wylie (2014), for example, differentiate between intended and enacted engagement. If the emphasis is on measuring the outcomes of engagement through behaviors, then the importance of the process through which engagement occurs can be overlooked. There can be "misalignment between the overt display of behavior and the covert processes" (p.224). This is one of the reasons why the authors did not focus solely on data collection to infer engagement but detail how the process of engagement was planned for using appropriate technologies as summarized in Table 1.

Detailed below are the specific technologies (tools) and relevant engagement strategies (methods) with reference to the objectives and outcomes of each discipline included in the Digital Humanities course.

## Religious Studies

The aim of this module was to examine and reflect on online expressions of religious experience to understand the relationship between religion and digital culture. Students first identified a contemporary topic or controversy about some aspect of religion that provoked online debate; searched on social media, blog posts, news sites and other online forums; and then created a project on the different ways in which religion was used and represented in the debate. Students had a choice to present the project in the form of a poster, photo essay, video, blog post, podcast, or a traditional essay. Students were encouraged to adopt a broad definition of religion, a commitment to exploring all sides of the debate, and a "hermeneutic of suspicion," that is, approach the object of study with skepticism. The lecture included discussions on how several controversies with religious content played out across digital culture. One example was #Jesuswept - a 2013 Twitterstorm involving Mike Huckabee, a US-based Christian minister and important political figure opposed to gay marriage. Students explored a range of online sources, perspectives, and topics, including abortion, gay rights, racism, and terrorism. How participants in these debates used (and abused) the rights and responsibilities of digital citizenship was also examined in the process.

In alignment with the lecture, Religious Studies tutorials focused on the relationship between religion, religious experience, and online digital culture. Craig Martin's *A Critical Introduction to the Study of Religion* (2012) provided a disciplinary vocabulary and set of practices. Frameworks such as a "hermeneutics of suspicion" and "methodological atheism" were tested in case studies, for example, a public debate in England about the overturning of a ban on advertisements promoting Christian prayer in movie theatres. These case studies provided opportunities for the students to reflect on online expressions of religious experience, as well as the vantage points of religiosity and secularism. Students were also invited to share phone applications (apps) that expressed their own religious identity, which helped to foster connections among the students at the start of the course.

For the second tutorial, students, with their peers, practiced the skills they would be using in their assessment. They critically analyzed a propaganda video produced by Islamic State which depicted an apocalyptic vision of a war in Europe. Students discussed the uses of religious iconography in digital contexts (the video having been produced and released online and disseminated through social media) as well as the narrative strategies in the video. The use of religious symbolism to convey antagonism between Islam and Western societies in the video required students to reflect on the non-geographic audiences of digital productions (in this case, largely Muslims living in Europe) and the way in which viral digital media can connect isolated people to larger communities and ideologies, be it through Facebook or memes. Students then contrasted the Islamic State production with responses to it, again, to examine how online debate functions.

## Philosophy

This module focused on ethical issues raised by new digital technologies. Students reflected on the personal daily use of technologies and wrote a structured philosophical argument either for or against uploading one's mind to a computer. This assignment incorporated the questions and methods of two related branches of Philosophy: metaphysics and ethics (or moral philosophy). It set out a thought-experiment - an act of imagination to inquire and think about a matter that cannot be pursued empirically - asked an ethical and a metaphysical question and required a philosophical argument. The lecture focused on this question as part of a larger discussion about the discipline and digital ethics. Most importantly, the lecturer modeled both arguments - for and against uploading - for students, and the required readings did the same. Students overwhelmingly argued against uploading one's mind to a computer and drew on different philosophical dimensions - ontological, epistemological, normative - as well as practical and moral reasons to make their cases. In this way, they reflected on significant questions in digital ethics.

Appropriately, the tutorials for the Philosophy module modeled a structured argument on the "uploading" debate, based on the works of transhumanist thinker Ray Kurzwell and philosopher Nicholas Agar (Agar 2011). Students were required to present both Kurzwell's and Agar's side of the argument. The arguments for both sides of the uploading debate were then put forward by two groups of students, setting the conditions for an in-class debate. This discussion and debate engaged students in the process of critical thinking and logical argumentation. The scenario of "uploading" invited questions ranging from the nature of language to the relationship between mind and body, making it especially fruitful for the course theme of personal identity. Students further deliberated over the role of moral decision making and epistemology and what makes a human being. Students recognized that the use of technology is rarely neutral and has profound social and cultural ramifications. These insights were followed up in the next tutorial by analyzing an extract from the 2014 movie *Transcendence*, starring Johnny Depp and directed by Wally Pfister, which is premised on a scientist uploading their mind to a computer. The film plays out the key areas of the philosophical debate, giving an added dramatic dimension to the hypothetical discussion, while also providing an example of the way in which course themes play out in popular culture.

## Art History

For the Art History component, students explored the multifaceted ways in which art, the act of curating art, and the platforms for art have been transformed in the digital age. Students were assigned a curating project where they had to select, organize and write labels (captions) for three artworks for a virtual exhibition in PowerPoint. To select their artworks, students used the online collections of major museums, including the Rijksmuseum (Netherlands), the Metropolitan Museum of Art (USA), and the Tate Gallery (UK). Their artworks needed to share something in common: either a "formal" aspect—such as material or color—or a "contextual" similarity—the same artist, subject matter, or time period. With this assignment, students gained familiarity with aspects of art historical analysis, curation, and online platforms. Although most students chose artworks in traditional media, including painting and sculpture, others selected digital art for their exhibit. Students also made connections between their own process of curating and the recent development of content curation websites, blogs, and playlists to manage online information. This gave them an appreciation for the ways in which the internet has democratized access (in this case, to artworks) but also the limitations of the online experience.

The first tutorial devoted to Art History required students to read a chapter from *Look! Fundamentals of Art History* by Anne d'Alleva (2010), which provided definitions of art to reinforce the lecture. Most useful to students was making explicit the contribution between the *history* of art and *contemporary* digital artistic knowledge and culture. The practices of formal and contextual analyses of visual sources were explored alongside the reading through a case study of *What Jane Saw*. This digital project developed at the University of Texas recreates two Georgian England art exhibitions visited by the writing Jane Austen during her lifetime. Students, in groups, digitally toured the gallery and chose different artworks to analyze formally and contextually. In this way, the project enabled students to reflect on the life of an artistic figure, engage in an interactive game as both a mode of storytelling and act of curation, explore questions about embodying a Georgian audience (and implicitly, the limits of such a bridging of experiences), while also accessing the display of $18^{th}$ century portraiture. Students then shared their experience and analysis.

The second tutorial built on this discussion by exploring digital photography and the "selfie" as a form of modern portraiture. This was topical to a younger audience of students for whom selfies are inextricable from social media practices. Students placed the selfie in a longer history of photography, explored the photo-sharing platform Pinterest, and discussed the extent to which the art and technology of photography can be emancipatory. A structured debate on whether a selfie can be considered art encouraged students to think critically about the practices of sharing personal images en masse as a profound shift in the power relationship between the photographer and the subject of their photo. Students argued variously that selfies could be empowering or objectifying, reflecting on tensions around identity and digital media. Digital selfies were, in this way, understood as a more deliberate form of cultural consumption. Students further pondered the contingency of forms of art – the selfie reflecting their context as $21^{st}$ century actors – and the act of curation (often transitory) entailed in platforms such as Instagram and Snapchat. Ultimately, students are producers and curators of artistic content on social media.

## History

The aim of the component dedicated to History was to demonstrate multiple ways in which the digital turn has affected the discipline. The democratization of access to existing historical sources stored in archives and depositories is one change. Available online are also new bodies of historical sources and new software for visualizing and interpreting such "big data." Google Books and its Ngram Viewer are good examples. The advantages and disadvantages these tools became the focus of the lecture and the basis for a History assignment. Students ran two Ngrams on any single idea or concept that was historically interesting or important. It could be a political term, moral value, slogan, famous individual, etc. The first Ngram covered at least three centuries' duration, and the second covered a 100-year period; the precise start and end dates were up to students to define. Students then wrote a commentary to explain why they chose the term they did and what they could conclude from each Ngram. Finally, students considered what the difference between the two Ngrams revealed about their idea or concept over time. This assignment required students to think historically, specifically about chronology, change, and continuity. It also combined new and traditional historical methods by using digital sources and tools for research and analysis of books.

The History tutorials engaged students in historical thinking in the digital age. Students were invited to identify history in their own lives and how they access historical content and gain historical knowledge, be it online streaming or traditional written texts. The complicated relationship between the past and the present was explored in a discussion of the controversy around a BBC children's online TV show about a mixed-race family living in Roman Britain and the ensuing Twitterstorm following an intervention by historian Mary Beard. The controversy and discussion prompted students to reflect on the uses of the past, and this example was particularly illuminating. The television show sought to highlight racial minorities in the present by picturing them in the past and, in turn, received a political backlash against multiculturalism by a literal whitewashing of the past. Students were invited to consider the extent to which a strictly empirical account of the past is possible, and how this might play out in digital contexts. Finally, the subsequent Twitter debate involving Beard provided a chance to explore debate online and the ways in which it can become vitriolic and dehumanized. (A discussion started during the Religious

Studies module.) The students explored how the study of history can both build empathy and foster enmity among people today, and their exploration demonstrated the importance of providing a critical gaze on the uses of the past in the present.

Following from this, the second tutorial explored how historians construct narratives of the past through research, selection, and analysis of primary source materials; the same task students would do - in microcosm -in their History assessment. Students were given the challenge of constructing a history of the battle of Pukehinahina, a crucial stage in the Waikato-Tauranga War fought between indigenous Māori and colonial forces in the 1860s. They were split across several groups, given a set of sources to locate via digital archives, and then asked to discuss how these sources might fit into a broader historical project. The sources included a variety of different types: newspaper accounts, witness accounts, visual sources such as the artwork, the writings of historians, and televised commemorations. These provided different aspects of and perspectives on the history of the battle. Students engaged with the problems of accessing and analyzing a range of British colonial and Māori indigenous sources, including written, visual, and oral, and how these might be presented in a digital medium. This activity spurred students to think about how future narratives of our present will be derived from digital sources and to consider their own participation in producing history in New Zealand society and the world more generally.

## English Literature

Finally, the course component on English Literature emphasized works of literature that are "born digital." Such works begin their existence as digital, as opposed to physical texts that have been digitized, and take full advantage of the creative possibilities of the digital medium. Literature that is born digital can include hypertext, so links outside the immediate text. This contrasts with traditional literature, making digital literature inherently nonlinear with no material boundaries. Another possibility is interactive fiction, whereby the reader has an active role as a co-creator in the narrative. Interactive fiction can also include images and sound. The assignment prompted students to explore such possibilities and comment on the meanings they made of them with one of two works of digital literature: Johannes Heldén and Håken Jonson, *Evolution* (2014) or Qianxun Chen, *Shan Shui* (2014). Students deeply engaged with these works, noting the endlessness created by *Evolution*'s algorithm, the evocative links between words and images in Shan Shui, and how both allowed for very individual immersive experiences. In the process, students reflected on how digital works such as these were radically changing writing and reading in the 21st century—perhaps to programming and playing?

The tutorials explored these questions around storytelling, programming, and playing. The first tutorial unpacked different approaches to literature in students' lives, and the foregrounding of language, aesthetics, imagination, intertextual and self-reflexive approaches as outlined in the set reading. Different theories of literature, and how language and stories might express identity, were tested through a video essay based on a set of E. E. Cummings' experimental poems. Students reflected on the history of literature, from pre- to post-industrial contexts, as precursor to considering the forms of cultural production in today's digital age. The second tutorial extended this discussion to students' habits of cultural consumption and critical analysis of storytelling in computer games. Students drew comparisons between games and literature, shared concepts of point of view (first, second person), agency and decision making. Then they explored Emily Short's *Galatea*, a work of interactive fiction. Short's work requires the reader/player to input command codes to move the story forward and unravel the mystery of the plot. There is no single path to victory; rather, there are numerous endings which inflect the readers/players experience of the overall story. As a class, students had to work together to learn the rules of the game, i.e. what advanced the story and what did not. In the process, they both used and contributed to this cultural form – a hybrid of literature and gaming - and then communicated the meaning of their experiences to one another, good preparation for their assessment.

## DISCUSSION

Instructional technologies, if chosen with sound pedagogical reasoning, can be integrated into learning environments to provide authentic, experiential learning opportunities that not only build knowledge but enable students to engage in the ways of the discipline. Since writing and critical thinking are core skills of the Humanities, it is important to acknowledge that technology has changed the structure and types of texts that students can produce and kind of critical thinking that the digital turn enables (Draxler, Hsieh, Dudley & Winet, 2012). The Digital Humanities course at the University of Auckland was designed to engage non-Humanities students with the ways of the Humanities disciplines in the digital age. The course was multidisciplinary, and team taught. Several strategies including signature pedagogies, authentic assessments and experiential learning were incorporated into the learning environment with the help of core and supplementary technologies relevant to the disciplines. The pass rates and student participation were consistently high but how significant was the link between the core technologies and the level of engagement?

Identifying the types and measuring the indicators and outcomes of engagement was not as important as planning the process of engagement. Warren (2016, p. 312) has demonstrated that such an approach enables students to "draw a bridge between ancient and current lived experiences" of the disciplines. Researchers such as Chi & Wylie (2014), Dewan et al. (2019), Henri et al. (2015) and Schindler et al. (2017) highlight the difficulties of defining and measuring engagement in technology-integrated learning environments but advocate for having some level of inference to make iterative design decisions that progressively improve student engagement. A combination of indicators for behavioral, emotional and cognitive engagement may give a fuller, more accurate insight into what works and what does not. In the Digital Humanities course, a combination of automatically collated data from the LMS, self-reporting via the SET evaluation and final grades all painted a promising outlook for student engagement. However, were the behaviors that led to such a data set intended or enacted? Chie and Wylie (2014) raise important questions about the validity of the types and measures of engagement, in particular, cognitive engagement.

## LESSONS LEARNT AND FUTURE RESEARCH

Sometimes it is more than the technology that is critical in facilitating high levels of engagement with the learning environment. In the Digital Humanities course experience, for example, two factors showed tendency to influence student engagement beyond the digital technologies. Firstly, the multidisciplinary collaborative teaching aspect was remediated to a certain extent with a common theme of the digital turn. Collins et al. (2015) demonstrated that such multidisciplinary courses can have issues around team communication and pre-course preparation. A lot of cohesion is required in the planning and administration of such courses to ensure the maximum potential of student engagement.

The second factor was student participation in non-technology centric activities. After the first iteration of the course, it was discovered that students did not make tutorial (or discussion section) attendance a priority. Since tutorial attendance and participation was central to student engagement and success in the course, students were offered "plussage" in the second iteration. Plussage is an assessment scheme at the University of Auckland which allows a student's final examination grade to count as their final course grade, rewarding students for their improvement and achievement over the entire course and not penalizing for early assignment grades. Plussage reinforced the course team's commitment to the modular structure of the course and the use of formative assessment. More than half of the students qualified for plussage by attending seven out of eleven tutorials and completing all five assignments.

Most of the pedagogical and engagement strategies used in the Digital Humanities course are consistent with what Schindler et al. (2017) recommended after a critical review of computer-based technology and student engagement.

- Context is crucial in the selection of technologies: discipline-specific tools were chosen based on the appropriate pedagogical strategies.
- Incentives are necessary to ensure maximum student participation: plussage and bonus points were utilized as incentives to promote student engagement in the course.
- Scaffolding is important for proper use of technologies. Technologies were integrated across the different components of the course, - lecture, tutorial and assessment - giving students the opportunity to ask for and receive extra help.
- Authentic and integrated learning design is key. Technologies served a secondary purpose in the design of the course; the focus was on engaging students with the ways of the discipline with technologies only being crucial to the unifying theme of the digital turn.

Iterative changes and further research will be influenced by: (a) the experience across the two offerings of the Digital Humanities course; and (b) the work of researchers such as Collins et al. (2015), Dewan et al. (2019), Henri et al. (2015) and Schindler et al. (2017). What is the role of the teacher in facilitating student engagement, especially in multidisciplinary team-teaching environments? How can student engagement be reliably inferred without compromising ethics and privacy? For now, the Digital Humanities team is encouraged by the success of engaging non-Humanities students in the Humanities disciplines.

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Like this article, our course, Digital Humanities: From Text to txt, was a collaborative effort. Initial inspiration came from our Head of School, Malcolm Campbell. Our colleagues in the School of Humanities at the University of Auckland--Caroline Blyth (Religious Studies), Kate Brettkelly-Chalmers (Art History), Tim Mulgan (Philosophy), and Lisa Samuels (English)--contributed their disciplinary expertise and innovative teaching and assessment strategies; their important contributions are reflected here. Finally, Genevieve de Pont helped to launch the first iteration of course. Her experiences spurred key revisions in subsequent years, and made the course stronger and more effective.

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# Chapter 9
# A Game-Based Student Response System:
## Engaging Assessment in the Classroom

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## ABSTRACT

*In this chapter, a game-based student response system, Kahoot!, is investigated. The purpose of the chapter was to analyze instructors and pre-service teachers' perspectives about the use of this platform. The advantages and disadvantages of integrating this tool in the classroom was investigated. Pre-service teachers' feedback and instructors' experiences using Kahoot! in higher education classrooms indicate that pre-service teachers welcome the use of these kind of games. Kahoot! can be used not only to increase student participation in the classroom but also as a formative assessment tool. Kahoot! can provide an engaging learning environment and adds active participation in the classroom by appealing even the most introverted students. In addition, immediate feedback feature of this game-based learning platform provides opportunities for instructors to tailor their instruction based on student understanding on games.*

## INTRODUCTION

The rapid growth of technology has affected our lives drastically over the last years. Technological tools, such as Internet, computers, smart phones, social media have become an important part of our daily lives. Especially for "digital natives" (Prensky, 2007) who were born in a digital age, technology is not anything special. They don't even view technology as technology because it is an ordinary tool they use in every minute of their time. Being a teacher of these digital natives in the 21st century is a great challenge as it requires technological and methodological skills according to the needs of the students' profile. In

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order to support 21st Century students' learning, teachers are expected to use emerging technologies to support student learning (Drent & Meelissen, 2008). The use of Web 2.0 technologies in education could prepare students to this rapidly changing world as they "blurred the line between producers and consumers of content and has shifted attention from access to information toward access to other people" (Brown & Adler, 2008, p. 18).

Over the last years there has been growing interest in the use of Web 2.0 tools in education. In order to prepare students to this changing world, teachers continuously seek new instructional approaches compare to traditional teaching methods. At this point, Web 2.0 tools help teachers to rethink the way to transform their instructional approaches to support more active and meaningful learning. There are many Web 2.0 tools that can be used in education to share knowledge (Kale & Goh, 2014). Web 2.0 tools in education have claimed to be effective in facilitating learning, interaction and collaboration by connecting students and resources (Attwell, 2007). Since the passive learning environments are considered as ineffectual, active learning takes its place and promote student participation. In this regard, Student response systems (SRSs) are used to make learning more interactive and engaging by helping teachers to create a student-centered learning environments (Wu, Wu, & Li, 2017; Fuller & Dawson, 2017). The student response system (SRS) is kind of a voting system by which an instructor can collect students' responses to given questions immediately in class.

Student response systems (SRSs) are used to provide classroom interaction with handheld devices such as "clickers" (Caldwell, 2007). These systems are usually called as interactive classroom systems, classroom response systems, audience response systems, learner response systems, or electronic response systems (Wang, 2015). They are frequently used as formative assessment tool for students to answer multiple-choice questions. SRSs are useful tools for teachers to assess students' knowledge about the topic. Even though SRSs are found to provide promising outcomes, they are limited on student motivation and engagement (Wang, 2015). They have some challenges such as time needed to learn and setup issues (Kay & LeSage, 2009). In the past, SRSs also had issues with investment in hardware devices (Wang, Zhu, Saetre, 2016). For example, in 1960s and 1970s, dials, buttons, or number pads were attached at students' seats (Judson & Sawada, 2002) so that they could dial answers from A to E. Thus, SRS use in those times was expensive and hard to use in a regular classroom. During 1990s, with the development of personal computers, the cost decreased (Cardoso, 2011). The use of SRSs nowadays is much easier to access and implement in classrooms. Studies related to SRSs have found that students find using smart phones to technologically convenient to answer questions (Yoon, 2017).

With the use of games in education, game-based student response systems (GSRSs) start to take the place of student response systems. The idea of using GSRSs in education is to help learners to remember previously covered content and assess their learning as they play and learn new concepts (Plump & LaRosa 2017). The main difference between GSRSs and SRSs is that the game-based version is more engaging and motivating with gamifying the assessment process. Game-based student response systems (GSRS) is found to increase motivation and engagement in the classroom (Licorish, Owen, Daniel & George, 2018). In circumstances where the classes are large and have a teacher-centered learning environment, maintaining student attention and engagement throughout the lecture can be difficult. Students in this kind of an environment start to become bored and interest in off-task behavior. The use of game-based student response systems can be beneficial in minimizing these kinds of behaviors by engaging and motivating students. Similar to other studies (Licorish, Owen, Daniel & George, 2018; Wang, 2015), Kahoot! was considered as a Game-based SRS (GSRS) rather than a traditional student response system (SRS) in the current study as it temporarily transforms the classroom into a gameshow. The idea of using games in education is that you are learning even you are not aware of it because you are so engaged and motivated. As a Game-based SRS (GSRS), Kahoot, would turn learning into a class-wide game-show so the students would not even consider the experience as learning.

Kahoot!, as a Game-based SRS (GSRS), is one of the Web 2.0 tools with a game-based learning environment that engages students through game-based quizzes, discussions and surveys (Kahoot!, 2018). This game-based learning platform, Kahoot!, provides formative assessment for teachers to adjust their instruction (Plump & LaRosa, 2017). The immediate feedback feature of the platform can be used by the instructors to collect evidence about student learning of the subject matter during the course of instruction. Based on the information, necessary instructional adjustments can be made in the course. In addition to the quizzes, the platform has survey features which can be used to collect anonymous classroom participation.

There has been research conducted related to the use of Kahoot! in education since 2015, a few years after the release date of the application. The most recent studies were discussed in this chapter to give the readers an idea of what has been done using Kahoot! in education. While the chapter focuses on the use of Kahoot! in education, it is worth to mention that the application is not only used in teaching, but also outside the classroom. The system is so simple to use and versatile that it has 1.6 billion cumulative players as of 2018, it has 70 million monthly active users. 60% of these users are based in the US, more than 50% of K-12 students in the USA playing Kahoot! every month (Kahoot!, 2018).

In their study, Plump and LaRosa (2017) shared students and their experiences using Kahoot! in classroom. They found that Kahoot! was easy for teachers to use in their classroom as it does not require any prior knowledge or training to use. Students welcomed the use of this game in education. Licorish, Owen, Daniel and George (2018) conducted semi-structured interviews with students to learn about how Kahoot! influence students'motivation and learning process as well as classroom dynamics. They found that the use of Kahoot! influenced classroom dynamics, engagement, motivation and improved learning experience. The use of educational games in the classroom improving the quality of teaching and learning by minimizing distractions (Licorish, Owen, Daniel & George, 2018). Similarly, in their study, Guardia, Del Olmo, Roa, and Berlanga (2019) found that students who used Kahoot! considered it a positive experience. The results of this study also suggest that the application created a fun and attractive environment which motivate students. Bawa (2019) conducted a mixed-methods study to learn if students have higher performance outcomes when they use Kahoot versus not using it. As a result, the study suggest that students' performance and engagement are enhanced when Kahoot was used in the classroom versus traditional teaching methods.

While several researches has been conducted using Kahoot in education, the aim of this study is to contribute to the better understanding of its use in pre-service teacher education and to explore the pre-service teachers' opinions and perspectives of using it in their in-service practices. The main purpose of using this application was to show different assessment tools to pre-service teachers and contribute to their vision of teaching. The purpose of the study was to evaluate the effect of a game-based student response system (GSRS) on pre-service teachers' perspectives. Pre-service teachers' opinions and experiences of Kahoot! were evaluated. For this purpose; the following research questions were investigated:

1. What are the general perspectives of the pre-service teachers using GSRSs in education?
2. What are the perspectives of the pre-service teachers about the effectiveness of Kahoot!?
3. What do the pre-service teachers feel about the advantages and disadvantages of Kahoot!?

## Kahoot!

Kahoot! is one of Web 2.0 tools that provide game-based quizzes and surveys. Kahoot! is popular game-based student response system that can easily make learning fun, inclusive, and engaging. The use of Kahoot! requires limited instructor and students' training. It is a free platform that has gained wide acceptance globally. As of 2018, there are 70 million users worldwide who use Kahoot in different languages (Kahoot!, 2018). Kahoot! includes quiz, jumble and survey options. While the current research was conducted using the quiz feature of the application, it also has jumble feature where students place answers in the correct order rather than choosing a single answer. In addition, it has survey option which can be used to collect data on students' opinions.

To sign up and log in to Kahoot!, the following website can be used https://kahoot.com. After log in, the quiz or survey questions and their answers can be generated related to the course topic. By default, players have 20 seconds to submit their answers for each question, but instructors can easily change the timer settings for any question.

Although the existing interface of the platform cannot be changed, it can be customized with subject-specific pictures and videos. The pictures or videos about the subject can be embedded to the questions when appropriate. The videos and pictures attached to the questions can make the assessment more appealing, at the same time they may help the students to understand the question. In addition, the background can be changed with a subject-specific picture as well. While the participants can use the platform over the Internet, if they like they can download the Kahoot! application.

When the instructor is ready to start the game, the platforms send a pin, the players go to the kahoot.it and enter the pin, their names, or nicknames. Students do not need to register for an account or download an application. These features make the set-up time and process easy and efficient; both important considerations for instructional purposes. Once all the players join the game, the game can be started. The players see the questions and the time limits on the smartboard or projector, and they answer the questions using their phones, computers, tablets, or laptops. When time is up, scores based on speed and accuracy are shown on the screen.

## METHOD

### Setting and Participants

The game-based student response system Kahoot! was used as a part of seven different undergraduate courses in the School of Education at a public university. This tool was used at least two different times during each class for exploring pre-service teachers' knowledge of the subject after it was delivered in lectures. Each Kahoot! was designed by faculty members related to the subject that was delivered in lectures. Kahoot!s were typically 10 to 15 questions long and were designed with many interactive features (including pictures and music). The pre-service teachers used their mobile devices, usually smartphones, to join the games and answer the questions. The faculty member visualized their responses after each question and the whole quiz.

The participants of the study were 312 pre-service teachers who were attending the mentioned courses in 2018-2019 fall semester. 294 of them were taking Information Technologies classes and 18 were taking Instructional Technology class. The age average of the participants has been found as 19. Out of 312 pre-service teachers 261 participated voluntarily in the study.

## Data Collection And Analysis

Pre-service teachers' feedback on the platform Kahoot! was collected using a Likert-type scale questionnaire. In addition to the Likert-type scale questions, open-ended questions that allows for individual responses were asked which were about the students' experience using Kahoot! in this course. The questionnaire measured the pre-service teachers' engagement, enjoyment, perceived learning, motivation, and satisfaction of the platform. The questionnaire had 17 questions, including 6 open-ended questions. Following are some example questions from the questionnaire. What is your Kahoot! awareness level?, What is your opinion about the following sentences? (I think it increases participation, I think it's an attractive application, etc.), What did you feel when you play with Kahoot!?, What is your opinion about Kahoot!?, What would you like to change if you can change anything in the application?, Were you encountered any problems when you use the app?, Would you prefer using such an app when you became a teacher? What are the advantages of using Kahoot! in class?, What are the disadvantages of using Kahoot! in class?. The questionnaire was sent out to seven classes and filled out voluntarily by 261 pre-service teachers attending the courses. In addition to the questionnaire, while the instructor of the course using Kahoot! in his/her classroom, one researcher observed the class and kept observation notes related to the students' experiences.

The qualitative data collected from the questionnaire was analyzed using content analysis method. The purpose of using content analysis is to organize and extract meaning from the data collected and to draw realistic conclusions (Berg, 2009; Şimşek & Yıldırım, 2011). The data collected from the open-ended questions was analyzed using RQDA, a qualitative data analysis software. The analysis started with open coding where the answers were read and re-read for familiarization and initial codes (Braun & Clarke, 2006). Then, codes that had similar ideas were recombined with thematic coding approach. Finally, themes were organized to create a narrative for each theme (Braun & Clarke, 2006).

## FINDINGS AND DISCUSSION

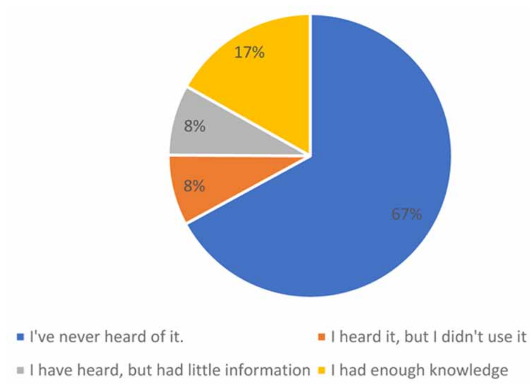
In this part, the findings obtained from the research and the implications based on these findings are included. Findings related to the three research questions are given below.

### RQ1. What are the General Perspectives of the Pre-Service Teachers Using GSRSs in Education?

In the questionnaire, the pre-service teachers were asked how much they knew about Kahoot! before the use of it in the current classroom. Responses from pre-service teachers are shown in the Graph 1 below. According to the answers received from the pre-service teachers, the majority of the pre-service teachers learned Kahoot! platform with these courses. More than half of the pre-service teachers who participated in the study stated that they have never heard Kahoot! before this course. On the other hand, one-fifth of the participants indicated that they had sufficient knowledge about it.

The findings show that the pre-service teachers found the game-based student response system (GSRS) increased their participation and motivation toward the course, made the lesson more fun, and the class interactive. The pre-service teachers stated that the use of the platform motivated them to pay attention during the lecture as it was fun and engaging. The pre-service teachers also reported that the

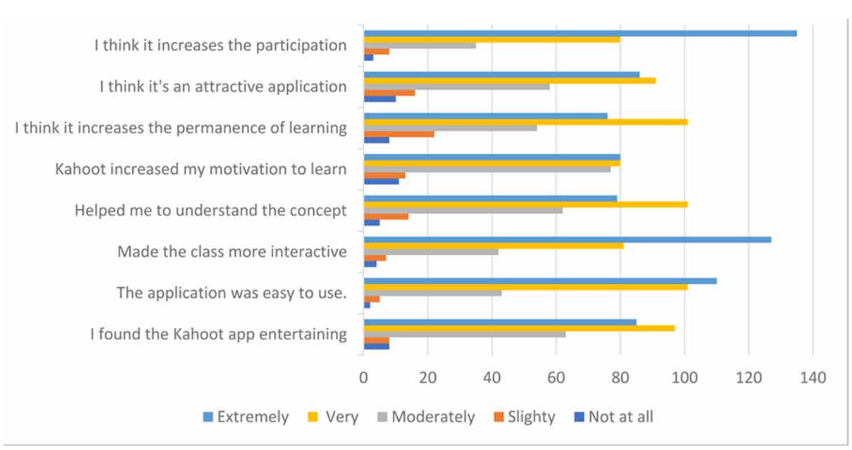
*Figure 1. Kahoot! awareness level*




game-based feature of the platform triggered competition among the students. Many of the pre-service teachers found the competitive aspect of the GSRS as a motivating factor to participate and creating an engaging learning environment. They also reported that the competitive environment that was created with the GSRS also influenced their interest in the lesson.

The researchers' observations also showed a GSRS gave students a different opportunity than a traditional classroom to interact and engage with the instructor and their peers. The pre-service teachers reported that Kahoot! made them interact more with the lecturer and their peers more than they normally would in other classes. The researchers also observed that Kahoot! increased their involvement and interaction in the class and the students who do not usually participate in class, showed interest toward the class and participated more than usual. The game-based feature of Kahoot! was found to positively improve the level of attention and participation in the classroom by appealing to all students. Observations showed that using Kahoot! in the classes provided a way for all students, not just extroverted students, to participate and contribute to the learning. The pre-service teachers also stated that the GSRS supported their learning experience. They found the GSRS helped them to remember the previously covered content, to correct any misunderstandings, and to cover any missing information.

*Figure 2. About Kahoot!*



One of the findings obtained from the study is that students feel excited and entertained during the use this kind of platform. The responses of the participants are shown in the Graph 3 below. They felt entertained because they find the practice fun and they feel excited about the competition that the game-based feature of the platform creates. The competition feature of the GSRS was a strong motivator for several of the pre-service teachers, as they wanted to reach the top of the scoreboard and be the best.

The participants were also asked about their feelings during the game and responses are shown in the Graph 4. The majority of the participants (77.4%) felt fun and (66.7%) excited. Considering excitement as a part of the game, it is an element that connects the participant/player to the game. In addition, a small number of students (6.1%) stated that they felt anxious during the play. The main reason of the students' concerns may be their own personality traits or test anxiety as part of the course.

## RQ2. What are the Perspectives of the Pre-Service Teachers About the Effectiveness of Kahoot!?

When participants were asked about their general opinions using Kahoot!, it was seen that the majority enjoyed the application. Figure 1 is the answers of the pre-service teachers within the scope of this question were compiled as a word cloud. The word cloud was created with the frequency of words in students' answers. The pre-service teachers found the GSRS interesting, fun and entertaining. Similarly, in observations, the researchers realized that pre-service teachers begged to play again at the end of a game. Even the weeks that Kahoot! was not used in class, the students asked for it to play. While a

*Figure 3. The reasons for increasing motivation*

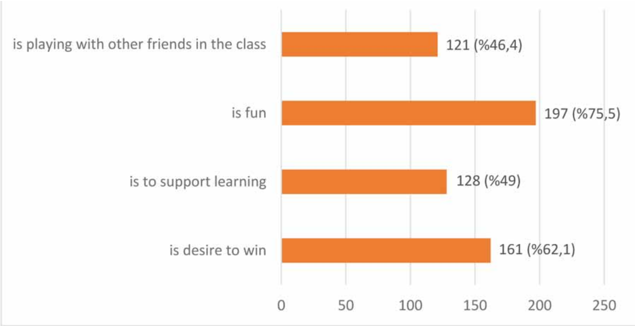
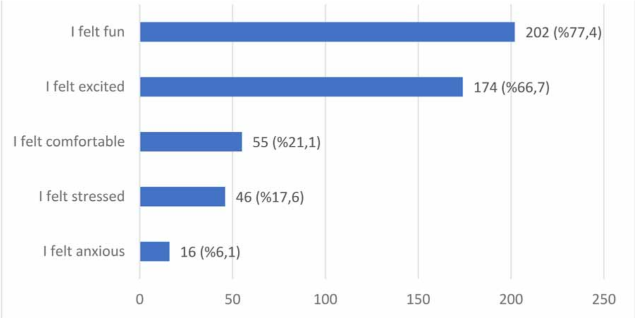



*Figure 4. When playing Kahoot!*



majority of students dread or unpleasant taking exams, it was interesting to see the students beg for a quiz. It is found that the students like to do review work in Kahoot! In addition to the fun and engaging feature of the application, the students considered Kahoot! as an instructional tool that enhances learning. In addition, the pre-service teachers found Kahoot! a useful and effective practice which creates a competitive environment in the class and increases student participation.

Although Kahoot! was found to be a fun practice in the classroom, the drawbacks were found by the participants. First, the pre-service teachers complained about the problems they experience due to Internet connection. Since Kahoot! is an internet-based application, there may be problems when the Internet connection is weak. The students stated that they were kicked out from the game during the application due to insufficient Internet connection. Thus, it is found that the major challenge that the students experience while using the application is that they cannot enter the application once again after the platform kick them out because of the Internet.

In Kahoot!, questions are shown on the main screen (the screen projected by the instructor) along with alternative answers. The answers are shown in different colors with associated symbols as shown in figure 2. As seen, it only shows graphical symbols rather than alphabetical letters. The students select their answers by choosing the color and symbol they believe corresponds to the correct answer. The pre-service teachers found this difficult as they had to select their answer by synchronizing with what they see on the main screen. Some of them stated that it would be more effective if they select the answers from alphabetical letters rather than the symbols. In other studies conducted using Kahoot!, a similar disadvantage was found (Bicen & Kocakoyun, 2018; Cetin, 2018). “Internet connection problems” and “questions and options are not visible on the application screen” are mostly mentioned in these studies.

Even though, the pre-service teachers were generally satisfied with their practice of the platform, there were factors that influence their engagement negatively. It is found that a few pre-service teachers had issues with the shortage of the time to answer. This situation should not be considered as a negative feature of the application because it is a situation that can be changed by the instructors preparing the questions accordingly.

## RQ3. What do the Pre-Service Teachers Feel About the Advantages and Disadvantages of Kahoot!?

As mentioned above Kahoot! application was used in a university setting with pre-service teachers. The main purpose of using this application was to show different assessment tools to pre-service teachers and contribute to their vision of teaching. In this regard, the pre-service teachers were asked about their thoughts using GSRSs in their future in-service practices. The participants stated that they would prefer to use this kind of a platform in their in-service practices as it is fun, attention-grabber, facilitating learning, increasing interest, motivation and participation. The pre-service teachers also talked about the disadvantages they see while using this application in education. One of the mentioned disadvantages was the fact that the application is carried out over the Internet as each student might not have access to the Internet. The other disadvantage they see; it might not be appropriate for the younger students as it might increase students’ anxiety and stress due to fear of giving wrong answer.

While a few pre-service teachers considered the competitive feature of Kahoot! as a disadvantage for the younger students, the rest of them considered it as a motivating factor for students to participate. One of the pre-service teachers described this with an example from his feelings, “While playing Kahoot!, I always wanted to reach to the top of the scoreboard. I think my students would feel the same thing and try to be the best in the class, so this is a motivating factor for them to participate and to give correct answers." The pre-service teachers also viewed Kahoot! as a motivator outside the class because they reported that the students would come prepared the class in order to well in Kahoot!.

The pre-service teachers were generally agreed that Kahoot! encouraged wider participation. While extroverted students often dominate the discussion in a regular classroom, the pre-service teachers viewed Kahoot! as a tool they can use to encourage introverted students to participate. The pre-service teachers also considered Kahoot! as a learning tool for their students. They stated that using Kahoot! in their own classroom would help their students to learn new concepts or to remember previously covered lectures. One of the pre-service teachers explain "I would give my students immediate feedback after each question to correct the misunderstandings." The pre-service teachers viewed Kahoot! as a tool that can be used to give formative feedback and to generate deeper understanding of the concept.

In addition to the questionnaire after each application, the researchers' observations during the process showed that the pre-service teachers enjoyed the GSRS. The immediate feedback feature of the application was invaluable as Kahoot! shows how many students got the answer right and most of which options has been selected wrong. By this way the instructors were able to see what the students understood and knew. It allows the instructors to provide immediate additional clarification and explanation on the question. These kind of post Kahoot! discussions gave students an opportunity to evaluate their knowledge, so they might immediately correct their misunderstandings or mistakes. The immediate feedback feature is usually not an option in a traditional assessment as the instructor is not able to see the evaluation results right away.

## CONCLUSION

In education, there has been an increasing use of game-based student response systems (GSRSs) to support student learning and encourage students to participate. However, there remained a conflict in the literature related to GSRSs as to whether they improved student learning and helped them grasp the content. In this regard, the current study explored pre-service teachers' perspectives on the use GSRSs in education. To reach this purpose, pre-service teachers' opinions and experiences of Kahoot! were evaluated. Pre-service teachers' perspectives using GSRSs in education, their thought about the effectiveness of Kahoot! and the advantages and disadvantages using it in education were explored.

According to the findings of the study, Kahoot! as a GSRS helped in creating a "fun" learning environment which contribute to interaction between student-instructor, student-student, and student-content, enjoyment of game-playing and competition. This finding is consistent with the previous research which found the use of Kahoot! in education increase interaction with the instructor, peers, and content (Licorish, Owen, Daniel & George, 2018; Plump & LaRosa 2017; Wang 2015). Consistent with Licorish, Owen, Daniel and George (2018), findings of the current study suggested that the immediate feedback feature of the GSRS gives an opportunity to instructors to provide immediate clarification and explanation on the content. It also gave students an opportunity to evaluate their knowledge. In this respect, the GSRS is a valuable tool in terms of providing feedback to students as it enables both students to receive immediate feedback on their situation and to give concrete opportunity to the whole class to discuss each question. With all of these benefits by collecting evidence about student learning of the subject matter during the course of instruction, necessary instructional adjustments can be made in the course to meet the student's individual learning needs. In addition, considering immediate feedback feature of this game-based student response system, GSRS can provide opportunities for instructors to tailor their instruction based on student understanding on games.

A weakness of using Kahoot! would be noise generation when it is applied in large classrooms. As Kahoot! creates an excited learning environment and when large groups of students become excited, the classroom becomes noisy. Consequently, the instructor who uses Kahoot! should be prepared for increased classroom noise. As mentioned above, Kahoot! temporarily transforms the classroom into a gameshow as the students are so engaged and motivated. They were all alert and eager to answer the questions. In this kind of an environment the participants might become noisy, but they learn at the same time. Even though a GSRS, Kahoot! in the present study, is based on gaming that creates a competitive learning environment, it also attracts student attention to the lecture (Hamari, et al., 2016). In the present study, it is found that Kahoot! grabbed the pre-service teachers' attention so that they were more interested in the lecture. It was also found that when they were so interested in gaming in Kahoot!, they were less interested in off-task behavior.

While SRSs are used to provide classroom interaction with handheld devices such as "clickers" (Caldwell, 2007), Kahoot! turned all students' electronic devices, such as computers and smartphones into gamepad controllers. Considering 21st century students and their relationships with technology, letting them use their own devices in the classroom and even learning with them was a special experience for them. However, the current study was conducted at university setting in a laboratory with computers and all students had smartphones with Internet connection, so devices and Internet connection was not an issue. This might be a weakness in regular classroom as students without a smartphone or Internet connection cannot participate in the game.

Game-based Student Response Systems (GSRS), such as Kahoot! can be used as an instructional tool for teaching in higher education by giving the 21st century students' affinity for technology and games. Educational games that are specifically developed for the purpose of educating or training found to be increasing student engagement by appealing to all students and creating a friendly competition (Kapp, 2012). These kinds of educational games have a positive effect on learning and engagement (Hamari, et al., 2016). Considering student engagement feature of GSRS, Kahoot! can provide an engaging learning environment and adds active participation in the classroom by appealing even the most introverted students.

While Kahoot! was used as a formative assessment tool in this study, there are many other ways to utilize this interactive tool in the classroom. Following are some examples:

- Warm up the class- use it as a starter.
- Introducing a new topic or chapter - at the beginning of the class.
- A formative assessment tool to conduct in process evaluations - during the class.
- An assessment tool at the end of a topic or chapter - at the end of the class.
- Poll students' opinions or answers - creating a survey.
- Using it as discussion activity.
- Using it in the "Ghost Mode" to see the students' progress - Kahoot! remembers how each student scored on each question. A previous Kahoot game is launched, students can compete against that session. It displays former attempts as "ghosts". Students can compare their current attempt to previous attempts to see how they have progressed.
- Sharing Kahoots with colleagues and other teachers- creates a pool of Kahoots to use.

- Encouraging students, especially pre-service teachers to make their own Kahoot! and use it in their own teaching.
- Creating a competitive, fun and engaging gameshow-based environment.

## FUTURE DIRECTIONS

During the application, it is observed that the pre-service teachers were fully interested in playing the game. In general, GSRSs provide a learning environment where participants answer the questions in a competitive and fun way. In the current study, Kahoot! was used as an assessment tool after the lectures to assess students' learning. However, for future directions, GSRSs can be used at the beginning of the lecture to assess students' prior knowledge, to introduce the basic concepts of the lecture, and as an attention grabber activity.

In this study, Kahoot! was used as a GSRS at university setting; however, given the limitations of the application mentioned previously, Kahoot! is not suitable for all age groups. Especially for younger students, another GSRS with higher visualization and easier synchronization can be preferred as Kahoot!s game-based feature might increase younger students' anxiety and stress due to fear of giving wrong answer. Thus, there is a need for careful configuration when GSRSs are used with younger students, considering its competitive environment.

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# Chapter 10
# E-Portfolios:
## Deepening Student Engagement in Learning

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## ABSTRACT

*This chapter describes the experiences of a liberal arts college that is part of a large research university implementing e-portfolios with a focus on learning engagement. Using qualitative data collected over time and programmatic experience, the team assesses the depth of engagement their students are experiencing, to determine whether most students are using e-portfolios to engage in learning on their own, or only when prompted to do so by faculty within the confines of a single course. Too few students have taken full ownership of their e-portfolios and engaged with them as a meta-high impact practice. Implications of this finding suggest faculty using e-portfolios need to be intentional about student engagement at the meta-high impact level. Part of achieving this is developing further clarity on what it looks like when e-portfolios are designed to be used as a meta-high impact practice while applying more rigorous methods to determine when students have reached this level of engagement.*

## INTRODUCTION

Five years ago, driven by an interest in other institutions of higher education sharing their experiences with ePortfolios, our own College of Arts & Sciences began an ePortfolio pilot. The College serves over 11,000 undergraduates and over 1,200 graduate students grounded in a traditional liberal arts education. The effort to adopt ePortfolios was initiated by the Learning Design & Technology (LDT) team, of which the authors are a part, based on their research and knowledge of ePortfolios. The team felt a liberal arts environment was a rich opportunity for using ePortfolios with an emphasis on student-centered teaching

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and learning. This effort paralleled several broad curricular efforts in the College, including the redesign of the general education curriculum, which in turn spurred much discussion about pedagogy and course design; the time seemed ripe to introduce ePortfolios and ePortfolio literacy to the College. Other uses for ePortfolios (expanded resumes, advising tools, showcases) were not ignored but were secondary to the more critical focus on teaching and learning. LDT gained support for the ePortfolio initiative after testing and evaluating interest on the part of faculty and the potential to support pedagogical goals of many courses and/or departments.

In order to develop a cadre of users for the ePortfolio, LDT focused initial adoption efforts on programs re-evaluating their curricula, and/or had shared outcomes, pedagogical approaches, or student types. This led the team to consider options within the general education curriculum, such as introductory level language courses, first-year writing courses, freshman seminars, and an occasional large-enrollment gateway course. Several benefits were suggested by this approach: putting an ePortfolio into students' hands early in their college career, with the hope they will continue to develop ownership of their portfolio throughout their college career; developing shared ideas across programs and curricula on the specific value of using ePortfolios; tapping into metacognitive activities across multiple courses; and introducing a large number of faculty to the pedagogy of ePortfolios. In sum, this approach was deemed to have the most impact for the most students.

Today the College has about 3,000 active students using ePortfolios. Over 300 faculty are working with ePortfolios to some degree, either as part of an assignment or fully integrated into their course design. Faculty have been, for the most part, quite thoughtful about the ways ePortfolios are integrated into their pedagogy, moving beyond their use as a repository of artifacts to asking students to "select, collect, and reflect" on their own learning. In turn, students in the College have created compelling ePortfolios. Opportunities such as the annual FolioFest allow them to present their ePortfolios publicly and talk about opportunities and challenges they face when creating them.

## BACKGROUND

While the evolution of any particular method of teaching and learning can be as varied as the number of practitioners involved, its salient features may be used to identify key stages of movement and change in the practice over time. The portfolio method has gone through such identifiable stages in its evolution over the last several decades. The following section briefly sketches the progression of the pedagogy from its roots in studio art education, to its surfacing in writing instruction and other academic subject areas, followed by its widespread adoption during the digital and network technology revolution. Finally, the new status the ePortfolio has gained as one of the high-impact practices (Kuh, 2009) found to engage students in higher education is discussed. The path outlined here traces a dramatic shift in responsibilities involving teaching, learning, and assessment. As Yancey notes in the introduction to *Situating Portfolios: Four Perspectives*, the objective of portfolio pedagogy seems to be "nothing short of changing the face of American education" (Yancey and Weiser, 1997).

Portfolios have typically been associated with a specific practice of teaching, learning, and assessment in disciplines such as design and visual arts (Eisner et al., 1996; Gardner, 1996; Castiglione, 1996; Madeja, 2004). As Madeja (2004 p. 8) explains it below.

*Art teachers have been using portfolio techniques at every level. Elementary art teachers create a portfolio for the work of every student, sometimes numbering in the hundreds of works, which they review at the end of each grading period. High school teachers have students save their work for at least the semester as a portfolio. At the college level, portfolios are used today as an entry-and-exit requirement for many of the art programs at colleges, universities, and independent art schools.… Thus, the portfolio has had a long tradition in the visual arts as an evaluation instrument to record student accomplishments.*

According to Castiglione (1996), the art portfolio is a vehicle for performance-based assessment in which the student presents "an artist's 'public self'… the way one desires to be viewed by others" (p. 2). The student is responsible for her/his own learning resulting in an educational context that is "student centered" in its perspective -- meaning it cedes in its pedagogy the locus of control to the student (The Glossary of Education Reform). Such shifts of learning responsibilities from instructor to student have been shown to have a positive impact on learning outcomes (Weimer, 2002; Magolda, 2007; Wright, 2011; Neumann, 2013). In this respect, portfolio-based art education has always been well established as a student-centered pedagogy.

The assessment method adopted for the writing program at SUNY Stoneybrook in the early 1980s by Peter Elbow and Pat Belanoff (1986) adopts the portfolio practice found in visual art education giving students control over the content in which they are to be assessed. As such, it too shifts basic responsibilities for learning from the instructor to the student to promote a student-centered learning environment. However, it adds something more to the portfolio practice in art education. According to Castiglione, art portfolios may consist of material "showing process through drafts, duds, and discarded approaches", but only on rare occasions (Castiglione 1996, 2). Typically, the content in an art portfolio is selected to primarily showcase one's highest achievements. On the other hand, academic-subject portfolios (such as the one in writing instruction) "frequently disclose considerably more about the student's private self because they include exemplars of process" (p. 4).

Elbow and Belanoff's conception of portfolio-based assessments confirms Castiglione's observation. Their writing students choose their best work to collect and present for critique, and include additional writing -- a "cover letter" -- in which students reflect on the choices they have made (Elbow and Belanoff 1986). The addition of this layer shifts assessment responsibilities from instructor to student, turning the assessment processes into a moment of learning for the student. By including the student's reflection, it also enhances the assessment process for the teacher. As portfolio practice moves into academic-subject areas such as writing instruction, it adds a meta-learning component (reflection) to the original framework of the portfolio in art education.

Over the decades of the twenty-first century the accelerated growth of networked digital technology has had a significant effect on the spread and evolution of electronic portfolio (ePortfolio) practice (Batson, 2002; Rees & Levy, 2009; Yancey, 2009; Khan, 2014). As Batson points out in "The Electronic Portfolio Boom: What's it All About", the ubiquity of networked connection and data-driven technology has pushed educational institutions to a technological threshold wherein electronic portfolios can now be adopted broadly (Batson, 2002). In this period of expansion ePortfolios, while continuing to maintain the original principles of allowing students to be assessed on self-selected materials supplemented by reflective content, have taken the practice in several new and exciting directions.

Networked technology impacts the kinds of tasks and activities taking place in the new electronic environment as well as the processes for portfolio-based teaching, learning, and assessment. As some have noted, the networked environment of the digital portfolio "creates a space for students to make connections among their different learning experiences" (Eynon & Gambino, 2017, p. 107) and provides them with "a central place to capture the learning that happens in a variety of contexts (academic, workplace, community)" (Light et al., 2012, p. 9).

Digital technology expands the scope of audience and constituencies involved in producing as well as assessing ePortfolios. Lorenz and Ittleson touch on the electronic portfolio's broad audience when they describe it as "a digitized collection of artifacts … that represent *an individual, group, or institution*" (emphasis added) (Lorenzo and Ittleson, 2005, 3). The Web platform makes it easy not only to provide others (classmates, graders, instructors, employers, etc.) private and public access to one's work, but to also collaborate with them (Zhang et al., 2011). Networking capabilities invite integrative authorship of content and joint building of connections showing relationships and greatly enhancing the representation of not only the individual student in a course, but also programs and curricula (Housego & Parker, 2009; Matthews–DeNatale, 2013; Yancey, 2019) as well as the institution as a whole (Bass, 2014; Eynon & Gambino 2017).

The digital possibilities of ePortfolios also expose "the materiality of learning" (Sorensen, 2009; Davis and Yancey, 2014) which can lead to improved documentation by making the learning process more "visible" (Johnson, 2012; Eynon & Gambino, 2017). These developments have helped to increase the types of artifacts organized, processed, and contained within the ePortfolio. Digital technologies provide users ready access to multimodal forms of representation (Yancey, 2004) and a highly flexible form of organization of, and navigation between, content elements in the portfolio (Selfe, 2007). The use of images, audio, video, and graphics is supported by tools for easily importing, editing, remixing, and exporting media, and loosening the rigidly linear format of print to facilitate multiple forms of navigation (Yancey, 2009; Stedman, 2012; Edwards, 2016; Sclatter, 2008; Kimball, 2005). ePortfolio platforms enhance digital composition in ways rarely possible in print format.

With the broadened possibilities of the ePortfolio, so do challenges and complexities. The ePortfolios' flexibility invites multiple pedagogical purposes and goals depending on the author's context and intended audience and constituencies. To that end, it can be designed for independent learning by students, for example, as a Personal Learning Environment (PLE) (Attwell, 2007, 2009; Buchem, 2012) where its application and use can go well beyond the educational setting to encompass employment and "life-long and life-wide" learning (Chen, 2009; Cambridge, 2010). Or, it can focus on instruction at the course and curricular level in order to, as one researcher put it, support "the choreography of teaching and learning" (Lane, 2007, p. 149). And in other cases, its purpose might be tied to informing administrators on fulfilling alignment and accreditation requirements, or clarifying institutional missions (Willbanks, 2009; Posey et al., 2015).

Potentially, the empowerment of ePortfolios with digital technology promises to address the wide-ranging technical needs of all groups involved in the practice -- the student, the instructor, and the administrator, among others. In reality, however, design constraints frequently raise hurdles and the platforms rarely manage to achieve the goal. Sometimes, the articulated needs can be contradictory. As some researchers (Garrett, 2011; Buchem, 2012) have noted, for example, the privacy needs of the "self-disclosing" individual student may not be compatible with the assessment needs of the institutional administrator. Structural issues may also get in the way as when course-centric learning management systems, designed with instructors in mind, make it difficult for students to access their own work for inclusion in their ePortfolios. (Queirós et al., 2011). Addressing the needs of all constituencies in a balanced and integrated fashion may not be impossible, but it is a difficult and often expensive task that, when it fails, leads to negative experiences and frustrated implementations of ePortfolio programs.

On the broader spectrum of student engagement in higher education, research has amply proven high impact practices (HIPs) such as first-year experiences, common intellectual experiences, learning communities, writing-intensive courses, collaborative assignments and projects, undergraduate research, diversity/global learning, service learning, community-based learning, internships, and capstone courses and projects, are key to providing students with a successful learning experience (Kuh, 2009). Recently, citing the extensive data accumulating on the practice, the ePortfolio has been added to the list as the eleventh HIP (Watson et al., 2016). At the same time, it has also been clear ePortfolios have the capacity to serve as the "glue" for supporting integrative documentation of the experiences students may have in any of the high-impact practices they encounter. This capacity has garnered ePortfolios the label of a "meta-HIP" activity (Hubert et al., 2015; Eynon and Gambino, 2017).

The effect of ePortfolio practice is, by design, not intended to be restricted to the specific course in which it is practiced. The experience forms connective tissue integrating students' disparate academic and co-curricular activities while empowering students to focus their attention on the continuity of their learning process. While ePortfolio implementations may vary, when the practice involves selective collection of work curated, commented on, and presented by the student, three principles are typically involved: 1) a student-centered approach to teaching and learning, 2) documentation of learning (making learning "visible"), and 3) a focus on the student's meta-learning (reflection). High-impact practices frequently engage students by foregrounding some combination of these principles. It is not surprising, therefore, that the ePortfolios potential to spread across one's total educational experience earns it the status of a meta-HIP. Echoing Yancey and Weiser's (1997) prediction, and Eynon and Gambino's (2017) injunction, "when done well", the ePortfolio cannot fail to be a truly transformational practice for teaching, learning, and assessment in American higher education.

## IMPLEMENTATION OF ePORTFOLIOS

The ePortfolio outcomes described in the literature are lofty and the positioning of ePortfolios as a strategy for student engagement provides substantial motivation for their use in teaching and learning. However, implementation of ePortfolios at the College has been a resource intensive and, at times, frustrating endeavor. With a multi-year commitment on the part of College leadership to pilot ePortfolios, the team was able to identify such challenges and develop solutions and responses to them. Some of these were one-time (integration into the University's learning management system) and others are ongoing and more complex (faculty understanding of how to integrate ePortfolios into course design.)

## EVALUATION AND SELECTION

ePortfolio implementation involves multiple stake-holders (students, instructors, administrators, etc.). As Randy Bass also points out, however, "E-portfolios can provide a means for clarifying and affirming localized institutional value" (Bass *Peer Review* 16.1 (2014): 35). While the LDT team hoped to eventually address the needs of all of the stakeholders, the initial purpose of the initiative was to introduce ePortfolio platforms focusing primarily on the needs of the individual student/author. To that end, Himpsl and Baumgartner's (2009) approach was used for ePortfolio platform evaluation; they utilized Michael Scriven's (1991) Qualitative Weight and Sum (QWS) method to come up with to assess the strengths and weaknesses of twelve ePortfolio platforms. For their purposes, the team reformulated the criteria to build an iterative review of what was considered to be local priorities and contexts. The "knock-out" criteria (non-negotiable features that must be present for a platform to even be considered) consisted of the following: 1) content management - the ability to import and export data to and from the platform, 2) networking - the ability to cross-reference content internally and externally to the platform, 3) portability - the ability to export whole ePortfolios in standard readable format, and 4) integration – the ability to connect and work with our institutional learning management system. In addition to the "knock-out" criteria, the team developed sixty-two weighted criteria organized in three categories: a) asset management - storage, retrieval, and archiving, b) content editing and remixing, and c) presentation and distribution. Unstated in the formal study, the team also solicited comments and reactions from students to assess their responses to each platform. After piloting several options, the team selected the ePortfolio platform that not only fit the criteria, but also garnered the most positive response from students.

With an ePortfolio platform selected, LDT began to manage the adoption and implement the solution. Below are several areas LDT considered and addressed as part of the process.

## Technical Preparation

Once the ePortfolio platform was selected, the team worked with the vendor to integrate it into the University's learning management system (LMS), a Sakai-based platform. This proved, as has happened in many other institutions, more challenging than expected. A fundamental difference between the two systems is the ePortfolio is student-centered by design, while the learning management system is course-centric, catering to the course (as defined by the Student Information System) and the instructor. The ePortfolio platform could technically be made to appear as another tool within a course set in the LMS, but it could not be integrated with the other tools there. In addition, the ePortfolio platform, as expected, privileged the student by giving her/him access to features not in the purview of the course instructor. These issues caused considerable confusion which are still being addressed today. Nevertheless, the elimination of the multiple sign in times and general availability of tools under one umbrella was welcomed by both instructors and students.

The team also developed a series of "how-to" videos and job aids for both faculty and students; these were focused on specific and discrete topics such as how to upload a video, how to copy from a template, or how to add a personalized banner to a portfolio. A recent, significant update to the platform required many of these resources be re-created and the team has relied on the vendor's resources to train users on the new features instead of creating customized versions just for the College. Other technical snags arose from time to time and fixes ranged from a quick phone call to ongoing issues requiring the team to initiate a help request with the vendor. It's difficult to assess how transparent or impactful these issues are to the students and faculty using the ePortfolio, but they do require sustained effort on the part of the LDT team to manage.

## Faculty Professional Development

The question of how best to prepare and train faculty for the use of a new learning technology is always important, but was amplified in this case by the depth of ePortfolios' technical and pedagogical complexity. The LDT team responded with a typical range of options including workshops, tutorials, and individual consultations. Perhaps most impactful, however, have been the faculty communities of practice developing around implementation in several instances, including a group of world language departments, instructors of first-year writing courses, and some faculty in Chemistry, Psychology, and Engineering. This experience has provided an opportunity for faculty to deeply consider the meaning of ePortfolios in their course design and pedagogy and share both successes and failures in their implementation. These communities have also enabled some programmatic assessment of ePortfolios and in at least one case (world languages) faculty have published articles on the design and assessment of ePortfolios. All of these initiatives proved valuable and continue to this day. Indeed, the team feels these support mechanisms have been instrumental to the successful implementation of the ePortfolio platform.

## Student Support

Assumptions that students, who are by many accounts digital natives, would intuitively take to using an ePortfolio and immediately grasp concepts such as file size/type, organization of media, and personalization of digital spaces, were proved wrong from the start. In response, LDT created a team of undergraduate students called ePortfolio Peer Consultants (ePPCs). The Peer Consultants are paid students who have shown proficiency with the technology of the digital platform as well as a good understanding of ePortfolio principles. Today, there are six students in the program. The ePPCs host office hours in several locations across campus including the undergraduate library and the Language Commons. They also occasionally attend class sessions to give an overview of ePortfolios to students and create resources needed for specific projects. Finally, this group of students has taken on the planning of the annual FolioFest, an event in which students can showcase their portfolios in a poster-session style. This event has attracted the interest of the ePortfolio vendor, who in turn has featured the work of several ePPCs in their own communication materials. While ePortfolios have taken hold with ePPCs and a core group of student users, the challenge remains for how to create both greater depth and breadth in student adoption of ePortfolios beyond individual class usage.

## Use Cases

Challenges notwithstanding, the College has seen adoption of ePortfolios take root in several areas, providing exposure to many faculty and students. The program began with ELA 2600, a one-credit elective course focused solely on introducing students to ePortfolios. In the course, students are required to create two ePortfolios, one "presentational" and the second based on "learning"; students can also, optionally, produce a third ePortfolio on a topic of their choice. This course has been running consistently since Spring 2015. It started with a focus on first- and second-year students; however, over the years, more and more of the students taking ELA 2600 have been third- and fourth-year students, indicating a broader acceptance of the program.

From there, efforts coalesced around the World Languages programs where the team was able to reach a majority of first-year students through their language requirements. Initially funded by a faculty innovation grant project, the Foreign Language Learning ePortfolio (FLLeP) started in 2014 with the College's two largest language programs, Spanish and French. The Language Program Directors for these programs were initially interested in incorporating ePortfolios into their curricula using a digital platform. In the second phase of the project, the languages grew to include Italian, Portuguese, Arabic, Russian, and Chinese. The program was assessed by an external evaluator in year three, and the findings were presented by the project leaders at the annual Institute for World Languages conference as well as at the international AAEEBL conference.

Subsequently, the leaders of the FLLeP project spearheaded the hosting of the 2017 AAEEBL Southeast Regional Conference at the University with Helen Chen as the keynote speaker. The FLLeP project has sponsored talks by ePortfolio experts such as Kathleen Blake Yancey and spawned publications of several articles as well as a chapter, "ePortfolios in a World Language Learning Curriculum" in K. Yancey's (2019) *EPortfolio as Curriculum: Models and Practices for Developing Students' EPortfolio Literacy.* While the formal FLLeP program does not exist anymore, several foreign language programs, including French, Spanish, Chinese, Japanese, and German continue to run a deeply integrated ePortfolio program.

A third initiative started in 2015 as a festive presentation by students in one of the early ELA 2600 courses. The program, eventually dubbed *FolioFest*, was opened to any student in the College who has created an ePortfolio in a course or on their own. Students use their laptops to show their ePortfolios to faculty and staff in a poster-style format; prizes were awarded to top ePortfolios in several categories. Gradually, the planning and implementation of *FolioFest* was taken over by the ePPCs, who are now responsible for putting out the call for ePortfolios and the evaluations and selection of winners in various categories.

### Scaling Through And Beyond The College

Until this year, the use of the ePortfolio digital platform was restricted to the College where, in addition to the language programs, ePortfolios have been used sporadically in the English Department's writing and composition program, in first-year Intro to Chemistry courses, and one Astronomy course. Recently, however, LDT has begun to provide access to other schools, as well. The Science Technology and Society program in in the School of Engineering and Applied Sciences (SEAS) and the School for Continuing and Professional Studies (SCPS) have implemented ePortfolios in some of their courses.

## QUALITATIVE DATA COLLECTED OVER TIME

The literature suggests ePortfolios increase student engagement; and are a multiplier of engagement. Students using ePortfolios at the College generally express interest in and satisfaction with using ePortfolios in their course work; determining if and to what degree the ePortfolio engages them in learning is less easy to discern. With the operational and technological aspects of the ePortfolio implementation well in hand, attention has turned to questions of better understanding the pedagogical impact and outcomes, and how those might be articulated. This is a rich discussion taking place among faculty, students, and LDT staff, and one shaped by the following questions:

1. In what ways does the ePortfolio contribute to an increased level of student engagement?
2. How might use of an ePortfolio grounded in a liberal arts general education enable students to experience the engagement of a meta-high impact practice?

Over the five years the College has been engaged with ePortfolios, activities have been informed by three sources of qualitative data accumulated over time. One source has been the reports from the FL-

LeP project transitioning from pilot programs to full implementation in three curricula. The Spanish, French, and Chinese language programs have been at the forefront of this development and their reports have informed the team on evolving faculty practice along with the range of reactions and responses by students. The second source has been close observation of students who have worked directly with the LDT team as the ePortfolio program has evolved. The experimental one-credit ePortfolio anchor course, ELA 2600, with a mix of students from first- to fourth-year, enabling the team to interact with a cross-section of students as they encounter ePortfolios for the first time. At the other end of the spectrum, the ePortfolio Peer Consultants (ePPC) program has allowed LDT to work with students who have advanced their ePortfolio experiences. Their role then is to partner with the team in not only supporting the program technically, but modeling and promoting the practice to their peers. These three streams of information have provided a rich source of data upon which to reflect.

## The Foreign Language Learning ePortfolio Report

The initial launch of the FLLeP program generated immediate positive response. The group of participating instructors was self-selected and represented those curious about ePortfolios to begin with; but their somewhat informed perspective was actually helpful in assessing the pedagogical value of ePortfolios separately from the technical issues plaguing the platforms still being tested at the time. As one of the pilot instructors put it in his report, "With few exceptions, both students and teachers embraced the idea of using an e-portfolio... although our use of the tool was quite restricted" (Simotas, personal communication).

The pilot followed up with a summer workshop structured around an instructional design model developed by the LDT team and run by the Language Program Directors for Spanish, French, and Chinese. The two-day workshop was intended to help the participants of each of the three departments to design and develop ePortfolio activities aligning with learning outcomes in their respective curricula. The results of the workshop activities were reviewed and slated to be tried in a small group of classes in each of the three departments the following year. The success of the pilot and of the curricular alignment workshop led to the FLLeP program being funded for a second year, this time with additional resources for an external reviewer.

At the end of the second year of the FLLeP program, the external reviewer met with instructors, program directors, students, and administrators to assess the fledgling ePortfolio project in the language programs. While the review focused on the three language departments engaged in curricular reform, the data collected also reflected a broader set of participants including Russian, Arabic, Italian, and Portuguese instructors who were also working with ePortfolios, albeit less formally. Nevertheless, the reviewer's report indicated to us some positive results:

*Impact on Student Learning: The greatest finding of significance was the student and faculty perceived impact on learning that increased between Fall 2015 and Spring 2016 semesters. Conditions most perceived to impact learning and engagement were: student autonomy and creativity, ability of students to assess and "see" their own progress on a continual basis, and connection to their peers through dynamic peer review which increased their motivation for foreign language learning. The conditions evidenced in the data align with those found in the literature on foreign language learning that emphasizes autonomy and situated cognition. The key recommendation is to develop a cohort model so students are working together gaining confidence in the format and promoting autonomy of learning.*

*Implications for Technology and Training: Students showed trends towards increased engagement with ePortfolio, that may increase over time if implementation challenges are addressed and resolved, particularly technical difficulties with: the tool; improvement in instructions for assignments; and improvement in training/support and increased utilization of the student ePortfolio consultants. (Pawlyshyn, 2016)*

The report also provided the team with information on areas of weakness with directions they should consider for further development:

*Greater Integration of the ePortfolio tool in Teaching and Learning in Foreign Languages: Student experience with ePortfolio is inconsistent and appears disconnected from other academic work. While there is some satisfaction with ePortfolio for foreign language, students are not yet open to crossing it over to other aspects of their academic or personal life or future career. It does not seem to be perceived as a learning environment, rather as an assignment and archive of their course work. Increased integration and clarity of purpose within a proposed cohort model would improve integration.*

*Implications for Program Assessment: Overall, the feedback on assessment reflects a need for refinement of the rubrics, creation of systematic approach to ongoing, mid-term and final assessment of student work in the ePortfolio, and an agreement among department and program faculty on how much should be counted toward the students' final grades.*

*When viewed by themselves, the departments and courses that were engaged in curricular reform (Phase II) were, not unexpectedly, found to show a more pedagogical promise once the most appropriate platform installed:*

*The Phase II research which piloted a summative assessment of program learning outcomes holds great potential for positive benefits for foreign language teaching and learning if an appropriate tool is used that serves the needs of faculty and the function of assessment. A tool with built in assessment capability … is essential to maximize this opportunity. (Pawlyshyn, 2016)*

Since then, the Spanish and French programs have fully implemented ePortfolios across all of their language courses. The Spanish Department has forged ahead into testing ePortfolios in its Study Abroad program. The number of other departments using ePortfolios, though still not at a curricular level, has also increased. While the ePortfolio program has grown mostly among the programs programmatically aligned to ePortfolio activities, the quality of the implementation even across those programs has not been consistent. Periodic surveys of students and instructors gaging "personalization of ePortfolios" and "impact of reflection" have revealed a strong positive relationship between courses in which instructors have emphasized these aspects of the practice and student attitude towards ePortfolios in general. Both Spanish and French have developed assessment rubrics and are collecting data for broader evaluation of their programs. The LDT team will be looking to see if these anecdotally-based observations are correct and, if so, how to ensure a more uniform distribution of best practices in ePortfolio implementation in language courses.

## ELA 2600 Course: Collect, Select, Reflect

The second source of qualitative data accumulated over time has been the experimental one-credit course, ELA 2600: Collect, Select, Reflect (see Kathleen Blake Yancey's entry in the MLA Commons, https://digitalpedagogy.mla.hcommons.org/keywords/eportfolio/#ulATSCaAYFUoV). Promoted as a course "where the content is you", the purpose of ELA 2600 was initially created to help first- and second-year students develop the habit of using ePortfolios to document their learning. As the course has become better known to the student body, third- and fourth-year students have begun to attend. The ability to handle the mix of students has bolstered our confidence in the value of the ePortfolio for every individual student in the College.

Though enrollment has fluctuated over the ten semesters the course has run, instructors have clearly seen an increasing number of students who "get it", i.e., adapt their learning habits to the ePortfolio process. Several of the students who have done well in the course have participated in the *FolioFest* program and, from there, some have gone on to get wage positions as ePPCs and stayed close to the program throughout the four years they have been at the College. The first cohort of such students graduated last year. Another cohort is about to graduate this year. These students have been a growing voice of peer-advocates for the program, not only through their role as technical support, but also their modeling of "folio thinking" (Chen, 2004) through their own use of the ePortfolio process, as well as their engaged participation in the design, coordination, and execution of the *FolioFest* events which the team, echoing ePortfolio principles, have allowed them (the ePPCs) to "own" (Britland, 2019). The association of these students with the program for their entire college career has been a tremendous learning opportunity for the LDT team.

### ePortfolio Literacy Survey

For an ePortfolio program to succeed, all of its constituencies, especially the students, need to be literate in its principles and practice. In Batson et al.'s Field Guide to ePortfolio, *ePortfolio literacy* is defined as "the negotiation, curation, and personalization of digital information and interactivity in order to create and communicate meaning and identity" (Batson et al., 2017). A brief survey was administered to active ePortfolio students asking them, to what extent they personalized their ePortfolios and what they gleaned from their reflection on the process? The responses show students do personalize their ePortfolios (when instructors allow them to do it) and they do reflect on their work (when instructors ask for them to do it). From this, the team has realized the important role instructors play in helping to frame the value and purpose of the ePortfolio for their students.

### Personalization of Digital Learning Spaces

Three-quarters of faculty surveyed encourage their students to personalize their ePortfolio environment while the remaining quarter neither encouraged nor discouraged their students; no instructor in our survey discouraged or disallowed students from customizing their ePortfolio. In response, nearly 80% of students reported they personalized their ePortfolio in one or more of the following ways: adding images and color, creating banners, developing a new layout, and creating their own menus and submenus. Based on student submissions in class and events such as *FolioFest*, the team has observed students express pride in their abilities to make their ePortfolio a more personalized representation of themselves and their work.

## Reflection on One's Own Learning

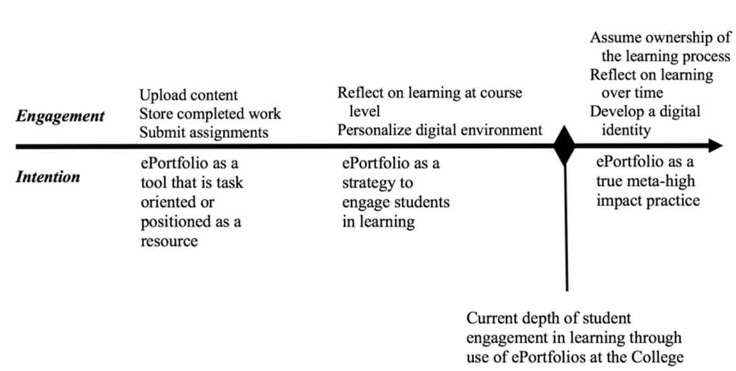
Nearly every instructor claimed they required students to reflect on their own learning as part of their work in the ePortfolio; however, just over 50% of students reported they used their ePortfolio to reflect on their learning. The discrepancy between instructor intentions and student perceptions could be due to a lack of understanding on the students' part over what constitutes a "reflective" assignment; or it could be due to a lack of alignment between the faculty and students responding to the survey. This gap suggests a need for further training with faculty to help them articulate to students the purpose of the ePortfolio and the assignments they've created using the ePortfolio.

## MODEL OF ENGAGEMENT

Anecdotally, the use of ePortfolios at the College has led to moments of frustration and technical missteps tempered by pedagogical breakthroughs and exquisite student portfolios. Qualitative data collected over time has helped augment our understanding of the impact of ePortfolios on student engagement. Early expectations set by the literature and review of other institutions' experiences were challenged by real experience with some clear gaps emerging. Returning to the questions asked earlier in this chapter (In what ways does the ePortfolio contribute to an increased level of student engagement? and How might use of an ePortfolio grounded in a liberal arts general education enable students to experience the engagement of a meta-high impact practice?) the team considered the depth of student engagement in learning through their use of ePortfolios. Based on the LDT team's experience administering ePortfolios over the past five years, qualitative data collected over time, and the results of digital literacy surveys, the authors suggest the following model (Figure 1) for understanding student engagement through the use of ePortfolios.

In this model, the team denoted the depth of student engagement by describing the activities observed in student ePortfolios. At the most basic level, students simply use ePortfolios as a tool for completing a task: uploading and storing work and/or submitting an assignment. This level does not suggest any engagement on the part of students, and in fact, might be considered detrimental to student engagement, as they struggle with some of the technical issues of the ePortfolio to accomplish something while not

*Figure 1. Model for depth of student engagement in learning through use of ePortfolios (Author, year)*



deepening their learning experience. The team did not observe many students at this level of engagement; it is possible this is because of the intense, early work with faculty focused on using ePortfolios as a teaching and learning platform. This also suggests a correlation between the intended use of ePortfolios on the part of an instructor with the level of learning engagement by students, something that is worth further study. The few examples of students who exhibited low levels of engagement were with instructors who either did not participate in LDT's professional development initiatives or if they have participated, have been steered toward other, more appropriate tools.

At the next level, students engage with learning to varying degrees, albeit in a narrow or course-defined way. They are beginning to exhibit portfolio literacy, evidenced through increasing ownership of their ePortfolios and the pride with which they present them at *FolioFest*. Students reflected on their learning at the course level, but rarely moved reflection beyond the immediate assignment or task. It is worth noting here how critical the role of the instructor is in prompting students to undertake this work; like any new skill, using an ePortfolio must be practiced before it can be mastered. The largest number of students using ePortfolios at the College are at this level of engagement.

The deepest level of engagement aligns with ePortfolios when described as a meta-high impact practice. At this level, full ownership of the ePortfolio is established, often in a way demonstrating students' thoughtfulness about their digital presence. Students not only reflect on discrete learning moments, but the entirety of their educational experience. They make connections across multiple domains and experiences, both curricular and co-curricular. In these instances, students have moved past the need for an instructor to guide or prompt their work in an ePortfolio, suggesting a higher level of metacognition and/or self-directed learning. This level is observed in a small number of students, such as those serving as ePPCs.

The LDT team reflected on the level of student engagement at the College to determine where their work with ePortfolios falls; that position is indicated on the model. The team's assessment suggests the use of ePortfolios is engaging students in learning beyond a level of managing tasks; a significant number of students are personalizing their digital environments and reflecting on their learning, while a lesser number of students are connecting this work with digital literacy skills. This is well beyond introductory uses of an ePortfolio indicated by activities like uploading content, storing learning artifacts, and submitting assignment. However, the College has so far not yet realized the full potential of ePortfolios as a meta-high impact practice. The team feels they are near the tipping point, but much work remains in training faculty on portfolio literacy and setting expectations for self-directed use among students.

## IMPLICATIONS

Having assessed student work with the ePortfolio implementation and identifying the level of engagement using ePortfolios is approaching, but is not fully realizing, a meta-high impact practice, the team considered the steps they might take to eventually realize this goal. Several themes emerged suggesting actions to be taken to help students move toward a deeper level of engagement.

Student-centered pedagogy and ePortfolio literacy are strongly aligned. This is important because the teaching mission at the College is supported both by LDT and a university-wide Center for Teaching Excellence (CTE), both of which broadly espouse student-centered pedagogies. Recognizing ePortfolios and ePortfolio pedagogy as important strategies in a student-centered teaching environment will help faculty make sense of how ePortfolios fit into their broader teaching goals while giving faculty another way to articulate the value of ePortfolios. The LDT team should seek to capitalize on this connection, seeking to bring ePortfolios into more conversations about teaching at the College and more directly speaking to the ways ePortfolios will enhance and deepen student learning.

Faculty using ePortfolios in learning and staff supporting their work need to be intentional about student engagement at the meta-high impact practice level. Once an instructor makes the decision to adopt ePortfolios, she/he should consider how to articulate to students the reasons and goals for the ePortfolio, then help students understand the role of ePortfolios beyond their own classroom. The team realizes this is a big ask of faculty. As Cambridge (2012) notes, ePortfolios "are hard to implement at scale in a way that embraces their transformational potential because they require not just changes in practice *but changes in responsibility.*" The LDT team and other similar groups across campus should develop additional strategies, such as team-based design (Bass, 2012), which can help faculty minimize the additional burden of adopting a new and complex learning technology. They must also consider ways to better anchor the goals and messaging about ePortfolios as a meta-high impact practice.

To better support faculty attempting to do this, LDT needs to provide additional clarity around when and how use of an ePortfolio becomes a meta-high impact practice. While the model presented in this chapter has grown out of qualitative observation over time, more rigorous methods should be applied both to determine what factors indicate use of an ePortfolio as a meta-high impact practice as well as to improve methods of knowing when students have achieved that level of engagement. This is perhaps the most compelling finding to emerge from the team's work to date.

## CONCLUSION

ePortfolios have the potential to impact student learning at a deep level by engaging them in the activities and tasks faculty design for their use. Further, ePortfolios have the potential to engage students even more deeply as a meta-high impact practice when they take ownership of their work in the ePortfolio while reflecting across their entire educational and co-curricular experience. At the College, work advancing ePortfolios over the past five years has resulted in most students using ePortfolios as a means to engage in learning at the course level; fewer students have moved beyond this level to engage with ePortfolios as a meta-high impact practice. The evaluation of the College's initiative enabled the LDT team to identify strategies for deepening students' engagement levels. It also, importantly, identified a need for more rigorous research around describing ePortfolio activities at the meta-high impact practice level while determining when students have engaged with their learning at that level.

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## KEY TERMS AND DEFINITIONS

**Digital Literacy:** Having the technical knowledge for producing content, as well as understanding the rhetorical conventions for effective communications, through a variety of digital applications.

**E-Portfolio:** A collection of digital artifacts gathered and organized to show one's skills, experiences, and achievements.

**Engagement:** The degree of involvement and vested interest shown by students towards their own learning.

**High-Impact Practice:** Courses and other academic and co-curricular activities shown to elicit a high level of engagement in students.

**Liberal Arts Education:** A curriculum providing students with broad general knowledge and intellectual skills in preparation for engagement in advanced domains of study or challenging fields in the workplace.

**Reflection:** The act of reviewing one's own actions, work, decisions, positions, or perspective in order to gain more insight of one's self.

# Chapter 11
# Engaging Flipgrid:
## Three Levels of Immersion

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## ABSTRACT

*This chapter explores the use of Flipgrid for student engagement in a gradual three-level process of technology integration. The three levels of integration, or "immersion," are acclimation, movement, and submersion, and this is demonstrated by comparing Flipgrid integration to a day at the beach. Flipgrid is a comprehensive tool that provides opportunities for educators to integrate it into their face-to-face, hybrid, and online courses to a limited extent or to fully use all of the features available to them at no cost. The background of Flipgrid, as well as the benefits of using video as an educational tool, was thoroughly researched to provide evidence to support the use of Flipgrid for student engagement and assessment. The chapter concludes by including the limitations of Flipgrid and future research directions.*

## INTRODUCTION

Student engagement is essential in the variety of classes available to college students today, including traditional face-to-face, fully online, and blended courses. All three types should include student involvement in meaningful educational activities (Kuh, 2003). One tool that can easily be used in face-to-face, blended, and online courses is Flipgrid (https://flipgrid.com/), a video response platform designed for student engagement and formative assessment. Flipgrid can be incorporated into college classrooms to varying degrees from one-time use to full-feature incorporation. Using a trip to the ocean as an analogy, Flipgrid users can enjoy a day at the beach by playing in the sand, dipping their toes in the water, or diving into the ocean. These three levels of Flipgrid immersion are acclimation, movement, and submersion, which are explained throughout this chapter (Craig, 2018). These levels provide for the incorporation of good practices in undergraduate education (Chickering & Gamson, 1987). Using teacher- and student-created videos as part of a learning experience in higher education can lead to a higher level of student engagement and better academic outcomes.

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## BACKGROUND

Flipgrid, originally named "Vidku," was the tech startup brainchild of a college professor, Charles Miller, and his graduate students at the University of Minnesota in 2014 (Chang, 2017). This startup had originally planned to launch the product for business but adjusted the strategy in 2016, changed the name to Flipgrid, and redirected their efforts to all levels of the education market (Grayson, 2018). Jim Leslie, CEO of Flipgrid, said in a 2015 interview with the *Minneapolis/St. Paul Business Journal*, "We didn't invent video and we didn't invent video sharing…what's unique is we're allowing people to have meaningful interaction on their own schedule and own convenience." (Grayson, 2015). Part of Flipgrid's success in the education market place is their commitment to educators: listening to and engaging teachers of all levels to create a useful product. In 2018, Microsoft acquired Flipgrid and made the platform free for all educators. Founder Charlie Miller said the joining of Flipgrid to the Microsoft community is "not just making Flipgrid free but bringing student voice to everyone and empowering every learner to share their voice" (Flipgrid, 2018e). Flipgrid's vice president of engagement, Joey Taralson, acknowledged in a tweet and on a blog that the success of Flipgrid is due to many educators using Flipgrid in unique and unimaginable ways: "We are here because of you. YOU ARE FLIPGRID" (Taralson, 2018).

According to Flipgrid's website (https://flipgrid.com), Flipgrid is used by millions of Pre-K to PhD educators, students, and families in more than 180 countries. Flipgrid regularly updates its features and has a strong social media presence of educator advocates called "Flipgrid Ambassadors." Flipgrid holds monthly webinars, monthly Twitter chats, and has an active Slack channel and Microsoft Teams workspace exclusively for Flipgrid Ambassadors. All the latest features are released through this network of educators. Once a simple platform, Flipgrid has evolved into a complete educational technology tool for all levels of educators, with many innovative features available at no cost to the user.

Student-created videos that use the Flipgrid tool incorporate Chickering and Gamson's (1987) seven principles: (1) encourages student/faculty contact, (2) develops cooperation among students, (3) uses active-learning techniques, (4) gives prompt feedback, (5) emphasizes time on task, (6) communicates high expectations, and (7) respects individual differences. This engagement is possible through the various features built into Flipgrid, which are further explained in this chapter. Student-created videos also incorporate International Society for Technology in Education (ISTE) standards for educators. ISTE is the leading global community of educators whose mission includes harnessing the power of technology to transform teaching and learning, solving problems in education, and increasing innovative practices. The educator standards reinforce many of Chickering and Gamson's principles through a set of standards that include the various roles educators play in the integration of technology, including learner, leader, citizen, collaborator, designer, facilitator, and analyst (ISTE, 2017). These standards lay the groundwork for successful technology integration in schools and higher education institutions.

Ultimately, as with every educational technology, the focus must remain on pedagogy and not on the tool itself. "It's not about edtech per se, it's about what you do with the tech to transform learning and improve student outcomes" (ISTE, 2019, para. 2). Educators at all levels are encouraged to make sure that their use of an educational tool is based on the learning outcomes or standards that will result in student learning. Oftentimes, educators will jump on the bandwagon to utilize the latest hyped technology tool without fully considering how the technology tool will benefit their students or solve a problem that they encounter in their classroom. Using video as a tool, including Flipgrid, should be utilized to meet the needs of students and be focused on student learning. Therefore, educators should choose to use Flipgrid at the acclimation, movement, or submersion level based on the student outcomes they are attempting to obtain and not on personal preferences or educational technology marketing ploys (Craig, 2018). Common Sense Education, a leading nonprofit organization reviewing EdTech, advises, "When used purposefully, Flipgrid is an engaging way for teachers to foster discussion and collaboration in a space that feels like the best parts of social media discussion without the free-for-all feeling of Facebook or Twitter" (Powers, 2018).

## THREE LEVELS OF FLIPGRID IMMERSION

Like a summer trip to the ocean, beach goers, or Flipgrid users, can enjoy a day at the beach in a number of ways. They can become immersed in Flipgrid just by playing in the sand (using the basics), "dipping their toes" into the product using a variety of the available settings, or "riding the waves" full force by taking advantage of advanced features. This chapter breaks down the Flipgrid tool into three levels of immersion: acclimation, movement, and submersion (see Figure 1). Acclimation introduces the new Flipgrid educator to the basics of signing up, creating a grid and topics, sharing the tool with students, and understanding the recording features. At this level, educators are enjoying the beach by merely playing in the sand and slowly acclimating to the use of this tool in their face-to-face or online classroom. The Movement level allows educators to get wet with the tool by using it with another instructor (copilot), adding content to the Disco Library, sharing the tool in other platforms, and giving feedback to students on their videos (with or without a rubric). The last level of immersion is Submersion, which has educators diving in by exploring features well beyond the basics. As described further below, these features allow *Gridpals* to globally connect classrooms, *MixTapes* to compile student thoughts, *Fliphunts* for scavenger hunts, and Flipgrid's accessibility tool called the *Immersive Reader*.

## TECHNOLOGY INTEGRATION

Technology usage can be intimidating to instructors, so demonstrating immersion at three levels might encourage a slow integration of technology into college classrooms. Instructors can integrate Flipgrid slowly so they can become comfortable using the tool themselves precisely and present its use to their students in a positive and efficient manner. This chapter presents the Flipgrid tool in a three-phased approach so that instructors can carefully integrate the use of student-created videos into their college courses. Instructors should start with acclimation to get comfortable setting up and introducing their students to the basics of the tool. The time of acclimation will vary by individual, but once instructors become comfortable, they can then begin to engage with additional features in the Movement phase. Last, once instructors have used the Flipgrid tool successfully with their students, they may choose to use many of the creative submersion features. Depending on the course content, their own comfort level, and course time constraints, an instructor may remain at the acclimation phase. The use of educational technology should be context dependent, as Flipgrid may not be able to meet the needs of every college class.

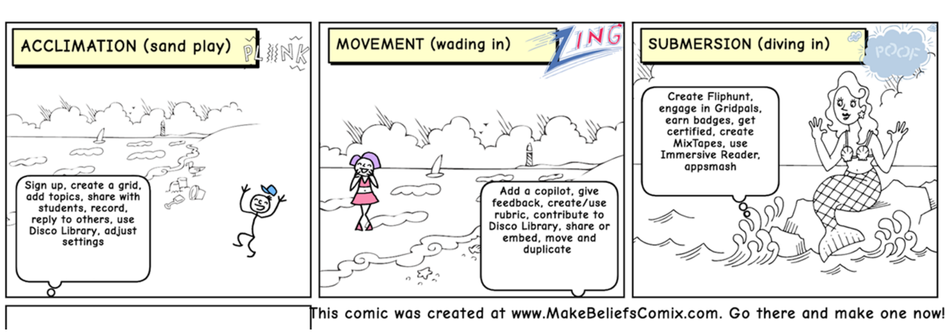
Making the decision to integrate technology in the classroom should be done purposefully and with the learning goals of students in mind. Kolb's (2017) Triple E Framework defines a method of effectively integrating technology tools into a lesson while keeping in mind the learning goals. The three *E*s of the Triple E framework are engagement, enhancement, and extension. For each of these three, Kolb defines the term and lays out three key questions to ask when measuring each in learning goals through a technology tool. Engagement is the first measure of the framework and "considers how the technology tools are helping students focus on the learning goals and tasks" (p. 30). Engagement is defined as the time a student spends on the task, actively focused and learning with the assistance of others. Flipgrid keeps students focused on the task through video creation, the need to critically think about a topic before sharing it in a video, and allows for the active discussion of the topic with others. Enhancement, the second component, focuses on how the technology tools help students understand the learning goals that could not otherwise be achieved. Enhancement asks, "What is the added value of using technology tools?" (p. 31). Flipgrid allows for every student's voice to be heard, which usually does not occur in a traditional, non-technological setting. Students have more time to think about their discussion responses before posting their videos, which potentially allows for a higher level of thinking that may not have occurred without the use of technology. Extension, the third component, considers how well the technology tool bridges classroom learning and the real world. Flipgrid allows for learning outside of the typical classroom because this cloud-based tool can be used for discovery anytime anywhere and allows for a connection to experts in the students' field of study. Depending on the learning goal that an educator is helping students meet, Flipgrid has the potential to meet all three measures of the Triple E framework. Using a framework such as the Triple E helps ensure that educators are integrating technology in a purposeful, effective manner that carefully addresses a problem or meets a specific learning goal.

## BENEFITS OF USING VIDEO FOR LEARNING

Video use in higher education, as seen in the literature, tends to be focused on flipped learning and screencasting initiatives. Flipped learning involves teachers creating or using existing videos to flip their classrooms. Students learn the content through the videos before coming to class. This allows for more student engagement in class through activities, hands-on practice, and the opportunity to answer questions posed by individual students. Sometimes referred to as the "inverted classroom," the flipped model has students engage with the content rather than absorb it more passively in a lecture-based model. As Roehl, Reddy, and Shannon (2013), wrote, "The time gained by removing the lecture portion from class allows for more one-on-one personal engagement between the teacher and students" (p. 47).

Recent studies on flipped learning show positive results in the fields of chemistry (Fung, 2017), pharmacy (Rose, 2018), statistics (Breneiser, Rodefer, & Tost, 2018), calculus (Sahin, Cavlazoglu, & Zeytuncu, 2015), social work (Loya & Klemm, 2016), foreign language (Filiz & Benzet, 2018), and

*Figure 1. Three Levels of the Beach Analogy*



economics (Caviglia-Harris, 2016). These studies demonstrate the effective use of teacher-created videos to move the lecture out of class and move the student engagement into the classroom. Other studies on the use of video in higher education include the use of videoconferences (Journell & Dressman, 2011), video tutorials (Williams & Gil, 2018), and lecture capture (Elliott & Neal, 2016), which are all very similar to flipped learning in that they are primarily teacher-led endeavors. Flipgrid can be used for flipped learning, but it can also provide opportunities for students to reply to the instructor or to one another in their own videos.

Another more prominent focus in the literature on video use in education is on screencasting. The benefits of screencasting include improved feedback to students, an effective aid for student learning, and the improvement of knowledge acquisition. Thompson and Lee (2012) defined screencasts as "digital recordings of the activity on one's computer screen, accompanied by voiceover narration" (para. 1). Numerous studies have shown success of using screencasting as an educational tool. In two separate studies, researchers found positive benefits of using interactive screencasting. In a secondary social studies classroom, Snyder, Besozi, Paska, and Oppenlander (2016) found that using embedded questions in a screencast led to increased student learning compared to when instructors used non-interactive screencasts. In addition, these researchers found that "since more time was given to hands-on, student-centered learning, he [the teacher] could provide one-on-one attention or vary resources when necessary to aid a student" (p. 42). The second study by Woodruff, Jensen, Loeffler, and Avery (2014) found that using screencasts with embedded assessments provided students with active learning options that resulted in improved test performance on higher-level Bloom's taxonomy questions in a college pharmaceutical course. Therefore, the more engaging activities instructors can add to teacher-created videos, the better the outcomes for students.

Studies have also shown a deeper or richer understanding of the course materials when students view teacher-created screencasts (Green, Pinder-Grove, & Millunchick, 2012; Tekinarsian, 2013; Thomas, 2017). Other studies focus on the use of screencasting as a tool to provide students feedback on their assignments (Haxton & McGarvey, 2011; Thompson & Lee, 2012). Although there are many impactful and interesting findings on teacher-created videos, the notion of student-created videos is more aligned with how Flipgrid is intended to be used. One study by Marinov, Webb, and Valter (2016) had medical students work in groups of three to four to design and record 5-minute screencasts on challenging topics. Students then viewed one another's videos. Survey feedback indicated that the video producers and consumers agreed that peer-generated screencasts helped their learning: "The process of designing, researching, and creating screencasts allowed for active student engagement with the material and encouraged students to discuss the topic within their group until they reached consensus in their understanding" (p. 1156). Another study of student-created videos by Greene and Crespi (2012) explored their use in two business courses. Through their review of the literature and their qualitative research study, they reported several positive aspects of student-created videos: "deeper learning; more engaged learning more active learning; experiential learning; more personal involvement—students must take ownership of their ability to acquire knowledge; and, a more entertaining and engaging experience" (p. 281). Flipgrid is a tool that allows for the creation of videos by students. Although these studies did not specifically study Flipgrid, they attest to the benefits of using student-created videos.

Only one study was found that specifically examined the use of Flipgrid. As a requirement of a master of arts program, Johnson and Skarphol (2018) used a mixed-methods approach to determine the effects of digital portfolios and Flipgrid on student engagement and communication. The sample included 50 art students at both middle school and high school levels who utilized Google Slides for digital portfolios and Flipgrid for communication. During a six-week period, the researchers found an increase in student engagement and communication leading to a positive, connected learning environment using these digital tools. This study used Flipgrid to facilitate connected learning by having students introduce and talk about their artwork. They were then asked to analyze and critique one another's artwork using the "'tell, ask, and give' feedback protocol" (p. 16). Johnson and Skarphol recommend the continued use of Flipgrid and digital portfolios to benefit student learning in a secondary art classroom.

The research on flipped learning and screencasting shows positive outcomes for student learning when teachers create the videos and students have the opportunity to view these videos on their own time, at their own speed, and as many times as necessary to fully understand the content. These studies also demonstrate that it is better to make the screencast more active instead of using screencasting as a replacement for passive lecture. The research tends to lack an emphasis on the impact of student-created videos. Using a video response tool like Flipgrid provides benefits to both the instructor and students: "Using Flipgrid isn't about recording videos…it's about learning. Learning that is social, personal, can happen anywhere and anytime, about making connections, it's deep exploration, and promotes that everyone is a teacher and everyone is a learner" (Moura & Fahey, 2018, p. I). Using a video tool allows instructors to hear from not just the vocal ones willing to raise their hands in class but from every student in their class, especially those normally underrepresented in typical classrooms. Hearing every voice allows for a relationship to form between faculty and students, among students, and even between the class and the community or experts in the field of study.

## VIDEO USE FOR HUMANIZING ONLINE LEARNING

Video also allows for the personalization of online and blended classrooms by building important connections among classroom members and between students and their instructor. A study in 2001 by Graham, Cagiltay, Lim, Craner, and Duffy examined the use of Chickering and Gamson's (1987) principles of effective teaching for the evaluation of online learning. These researchers created online lessons that fit each of the seven principles and can apply to the use of videos in online classrooms. For example, Principle 2 states that good practice encourages cooperation among students and was translated to the lesson that "well-designed discussion assignments facilitate meaningful cooperation among students" (p. 1). Flipgrid provides the safe space for these discussions to successfully occur in the class. Also, Graham et al. found that Principle 3, which posits that good practice encourages active learning, translates to the lesson that students should be presenting their course projects. This reinforces the idea that Flipgrid is an effective tool for students to share their learning by uploading their video presentation to a grid so that all students can view it and comment on it.

Videos facilitate human connections. Seeing and hearing students' voices help create connections among learners and the instructor. It humanizes the online environment that is typically seen as an isolated, lonely learning experience. In the EdSurge On-Air Podcast, Pacansky-Brock and Berman, creators of the Humanizing Online Learning effort, emphasized the importance of humanizing learning in online classrooms (Young, 2017). Pacansky-Brock discussed "the shift" she saw in online learning when she began to use Voice Thread, an educational technology tool that serves a similar function as Flipgrid. The goal of humanizing learning is for students to relate to their instructor as more than a subject-matter expert and consider themselves a part of a community of learners, which thereby will lead to more motivation, satisfaction with learning, and success in achieving the course's learning outcomes (Pacansky-Brock, n.d.). The humanization of learning stems from a theoretical framework by Garrison, Anderson, and Archer (2000) called the "Community of Inquiry" model, which includes three elements: social presence, teaching presence, and cognitive presence. A video tool like Flipgrid provides an opportunity to create (1) a social presence or community of learners by enhancing the "immediacy and closeness between instructors and students," (2) teaching presence by having instructors record themselves showing who they are as individuals such as demonstrated "humor, wit, and personable context"; and (3) cognitive presence "since viewing and reviewing the educational content are in the hands of the instructor and student" (DeWaard, 2016). Video is one tool that can be used to ensure that the Community of Inquiry model allows for successful online learning.

Flipgrid is specifically highlighted, along with YouTube Live Events and Google+ Communities, as three applications that can effectively engage students online (Taleo, 2016). It should be noted that Google+ Communities were shut down for personal accounts in April 2019 (Google+ Help, 2019). Taleo (2016) recognized that Flipgrid "is very visual in its design and function and encourages the visual and audio aspects of learning" (para. 6). In addition, Flipgrid is described as a tool that builds community because it feels more like a conversation than a typical text-based discussion forum. The difference between using Flipgrid and YouTube Live Streaming is asynchronous versus synchronous. Flipgrid is asynchronous so that students can re-record themselves as many times as they would like and have features to edit the video; on the other hand, YouTube Live as a second video option is synchronous real time without the option to make changes to the ideas in a discussion before they are shared with everyone. There are benefits and drawbacks to both asynchronous and synchronous tools.

Understanding the benefits of an educational tool is essential before making the decision to incorporate the tool into a class. There are many different video options available aside from Flipgrid: screencasting options such as Screencast-O-Matic or Screencastify; synchronous tools such as YouTube Live, Facebook Live, Zoom, and Adobe Live; video animation tools such as Animoto, Powtoon, AdobeSpark; and video, voice and text commenting such as VoiceThread. Many options are available to educators, and some of the previously mentioned tools can be used with Flipgrid, which is also referred to as appsmashing when two or more educational technology tools are combined for added benefits. In the next sections of this chapter, each of the three levels of Flipgrid will be explained with examples of their use in higher education.

## Exploring Level One: Acclimation

Acclimation introduces the new Flipgrid educator to the basics of signing up, creating a grid and a topic, using the Discovery Library, and understanding the recording features. At this level, educators are playing in the sand and slowly acclimating to the use of this tool in their face-to-face, blended, or online classroom. Signing up for an educator account is the first step to using Flipgrid and requires a Google or Microsoft account. Educators need to provide some basic information about themselves, including the age of their learners as well as their subject of expertise. An educator account allows access to the teacher dashboard with all features available at no cost. Flipgrid is part of the Microsoft suite of learning tools and is thereby FERPA compliant (Flipgrid, 2018d). As part of their privacy and terms of use policies, Flipgrid (2018b) recommends that teachers collect parental consent forms that are available on the Flipgrid website. These forms are designed for students under age 13 in the United States and age 16 elsewhere, but they can be modified for use in higher education if needed.

The next step in acclimation is to create a grid (see Figure 2). A grid is similar to a classroom, as it is a site that houses all assignments ("topics" in Flipgrid terms). Grids are usually labeled as a particular course, such as "Contemporary History" or "HIS270." Some educators may decide to have a grid for each student so that they can house each student's work individually, such as "John Smith." Or an educator might create a grid for community members to share their thoughts on a recent local issue, such as "Anywhere Civic Society."

Grid owners have one of three options in setting up how their students will be able to log in to the grid: (1) School email, (2) Student ID, or (3) PLCs and Public (see Figure 3). For college students, it makes sense to either set up the grid as Option 1 in which students would log in using their school email address or as Option 3 in which they would log in using either a Google or Microsoft email address. In many institutions where students' email addresses are either Google or Microsoft accounts, either of the two options would work similarly.

A grid might also be created to serve as video-based office hours for faculty members. A QR code can be fixed to faculty members' doors and students can use their phones to scan the QR code, which takes them to a grid where they can leave a video message for the faculty member. A link to this type of grid could be included in a learning-management system for blended or fully online students who do not physically come to campus. Li and Pitts (2009) found that although students' use of virtual office hours was not significantly different from their use of traditional office hours, participants in classes that offered virtual office hours reported higher levels of satisfaction with office hours than those students who were offered only traditional face-to-face office hours.

Once a grid is created, the next step is to add topics or video-based assignments for students. Topics are where an educator can communicate their assignment expectations to students. Topics can be text based, but it is highly encouraged to have instructors create their own video to provide assignment instructions or upload a longer video of course content to use Flipgrid as a flipped learning tool. The grid must include a title, text description, and the set response time of anywhere from 15 seconds to 5 minutes (see Figure 4). Instructors can also consider adding a topic tip that would appear in the corner

*Figure 2. Creating a Grid*

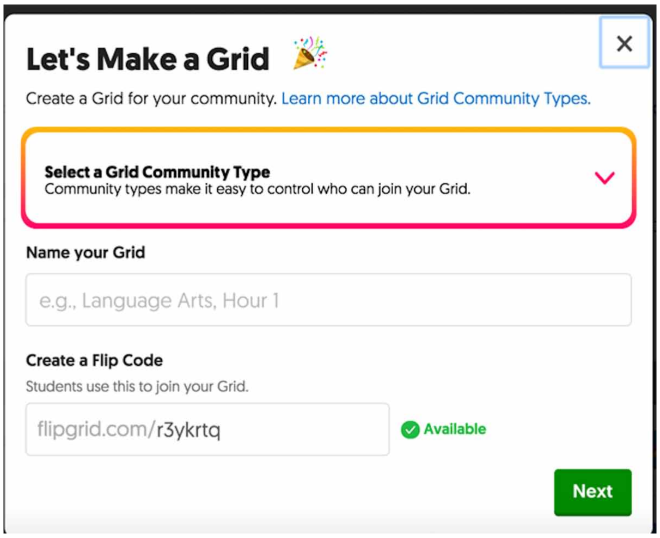
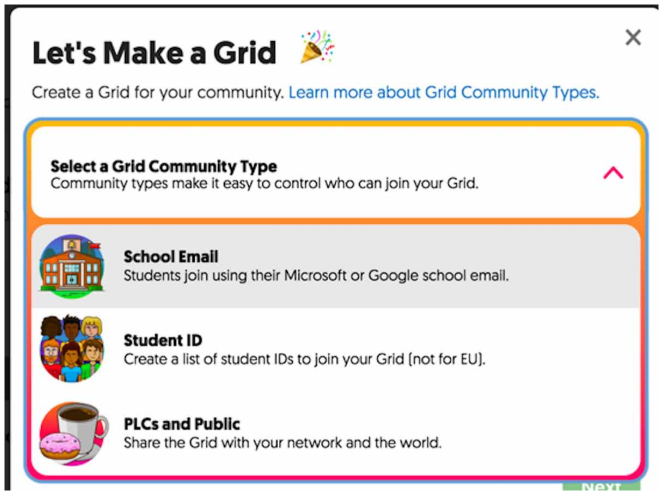


*Figure 3. Three Grid Types*




of the screen when students record, such as "Don't forget to start with your name" or "Speak loudly enough to be heard." Topic descriptions are meant to be concise because the field allows for a maximum of only 500 characters.

As an option, the grid also allows the ability to record a video, upload a video from a device, link to a video from YouTube or Vimeo, add a Giphy, or add an emoji (see Figure 5). Instructors can use one of these methods to engage their students and set the expectations for the assignment topic. Setting and communicating high expectations for all students and including the time on task expectations are good practice strategies, according to Chickering and Gamson's (1987) original work in higher education. Creating topics or assignments should directly relate to the learning outcomes to ensure that the technology is being used appropriately to reach the set goals and not just because the tool is new and flashy.

*Figure 4. Creating a Topic*

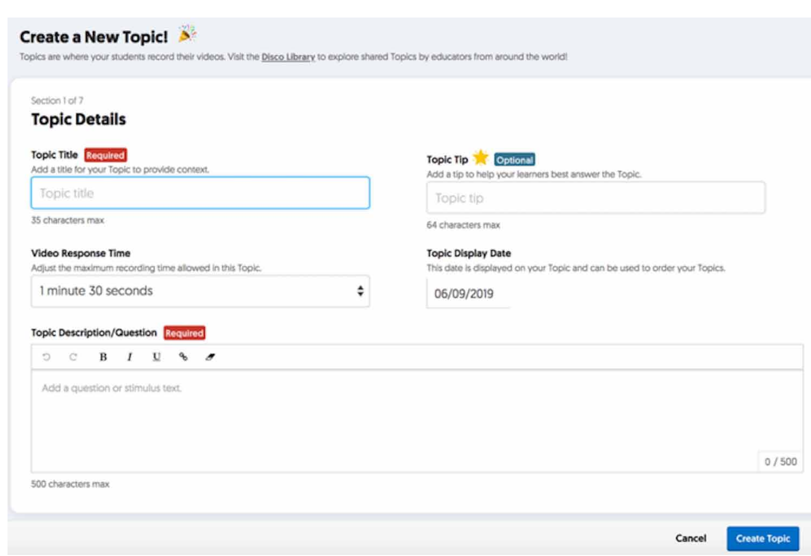
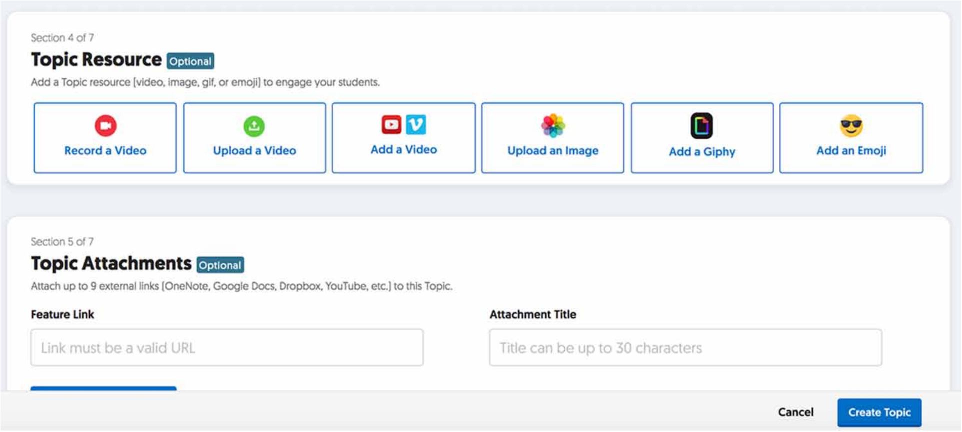


*Figure 5. Topic Resource Options*



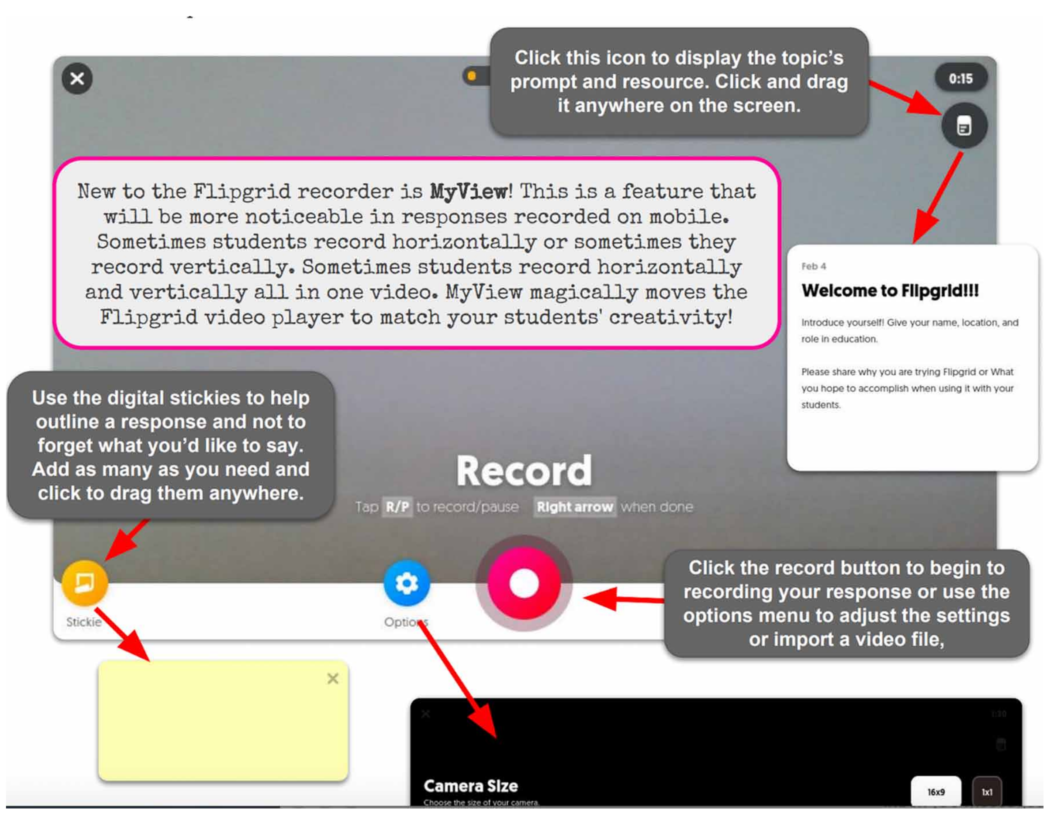

As explained in the revised version of Bloom's taxonomy, topics should be created to coincide with the intended outcomes, ranging from remembering, understanding, applying, analyzing, evaluating, to creating (Anderson, Krathwohl, & Bloom, 2001). For example, using Flipgrid for "remembering" might entail having students record themselves reciting a famous poem or a historical document, or an instructor seeking to encourage higher order thinking such as "creating" might ask a student to create a public service announcement (PSA) based on a research project (Anderson et al., 2001). A topic created by a teacher might include instructions for students to participate in a video discussion on a particular topic or on a video they viewed. A teacher creating a topic might ask students to explain a concept they recently learned or to upload a videotaped presentation. Roschelle, Pea, Hoadley, Gordin, and Means (2000, as cited in Kolb, 2017) found that although there are many technologies that focus on a "drill and practice" approach, technology should instead be supporting critical, higher-order thinking and problem-solving skills.

Once the topic has been created, it needs to be shared with students so they have access to create their videos. The grid (classroom) or the topic (assignment) can be shared with students in one of three ways: (1) by giving students the grid code that they use to log in through flipgrid.com, (2) the direct link to the grid or topic, or (3) through a QR code that is already embedded within Flipgrid. Depending on how the grid was set up by the instructor, students need to authenticate through their Google or Microsoft accounts, enter a student ID number, or log in with their school email address.

Once students have access to the grid, they can begin recording using the green plus sign, which opens the webcam on their PC or the camera on their tablet or cellphone. The recording features are regularly being improved with the latest update expected in late June 2019. Students have the option to type notes on digital sticky notes and post them on the screen so they do not have to look down or away from the camera while recording their video. The recording works very easily and intuitively by clicking the record button to start recording or to pause the recording at any time (see Figure 6). Other options include the ability to flip between two cameras, front and back, as necessary, At the end of recording, students can trim their video at particular points in the video, add more at the end of the video, type a title or hashtag for the video, and add an attachment to the video in the form of a URL or link to a G Suite or Microsoft file. These recording and editing options help students present their best self before the video is submitted to the instructor. After completing the recording, students are prompted to take a selfie, which becomes the fixed view on the specific Flipgrid topic and the student can add stickers to their selfie photo, including a wide range of emojis, masks, wigs, objects, or drawings. If students do not want to take a still photo, they can select a frame from the video or import any image to serve as the fixed view on the topic. These recording features are self-explanatory and easy for both instructors and students to master quickly. According to Flipgrid's (2019c) Help Center, short video tutorials are available on the Flipgrid website that instructors might add to their assignments to easily acclimate students to the use of Flipgrid. An update to Flipgrid's recording features is expected to be announced publicly at The International Society for Technology in Education's annual conference in June 2019.

If the feature is enabled, students are able to reply to others' videos, thereby creating a video-based discussion. Videos can be opened up for all students to view or be kept private for viewing by the instructors only. To have an effective video discussion, the instructor should give specific expectations to students on what they are looking for in the responses and how many to complete in a particular time frame. Discussions help create a community of engaged learners and encourage at least two of Chickering and Gamson's (1987) good practices of promoting contact between faculty and students and cooperation among students. Depending on the assignment guidelines, faculty get to know students in a less formal way by being able to see a bit of a student's home environment, if he or she records at home. If encouraged, students can share an aspect of their lives that would normally be excluded from the classroom setting, such as pets, children, spouses, roommates, team members, and their living conditions. Darling-Hammond, Zielezinski, and Goldman (2014) found that technology is most effective when it is

*Figure 6. Recording Features (Moura & Fahey, 2018)*



combined with opportunities for "strategic teacher support and social interactions among students" (p. 11). Getting to know one another through Flipgrid responses and replies creates a supportive learning environment. It helps faculty to get to know their students in a slightly different way in order to build strong relationships, which can lead to better student outcomes.

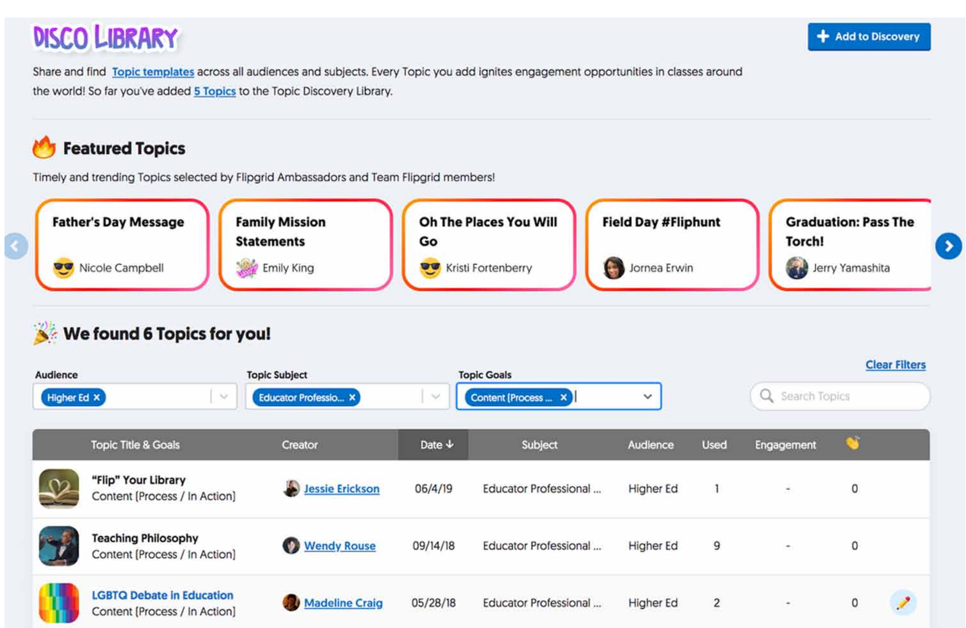
A helpful feature for getting acclimated to Flipgrid is the Disco or Discovery Library. This is a repository of Flipgrid topics that are arranged by audience (e.g., higher ed, family, high school), topic subject (e.g., history, business, digital citizenship), subject and topic goals (e.g., beginning of a lesson, family involvement, introduction/icebreaker; see Figure 7). The library provides an opportunity for instructors to see how others are using Flipgrid and to copy any of these topics (without student responses) and add them to their own grid. In addition, the library contains the explorer series, which includes engineers, scientists, and other experts in the field sharing their expertise. Each month, the library features explorers, and the topics from these series can be added to any educator's grids. Featured explorers have included topics that teach coding, math magic, shark misconceptions, robots, and aquariums. Using the library of existing topics can help educators more easily acclimate to the use of Flipgrid with their own students.

Getting started with Flipgrid through a gentle acclimation by staying in the sand or just testing the temperature of the water allows wary educators to get their feet wet before embedding themselves fully into Flipgrid. Signing up as an educator, exploring the Disco Library's existing topics, creating a grid and then a topic or two, and sharing it with students will make an educator more comfortable using Flipgrid to engage students. Acclimation is the first step to Flipgrid immersion.

## Exploring Level Two: Movement

The Movement level allows educators to get wet up to their necks in the tool by using it with another instructor (copilot), adding content in the Disco Library, giving feedback and using an existing or created

*Figure 7. Topic Discovery (Disco) Library*



rubric, sharing on other platforms, and duplicating and moving videos. This second level of Flipgrid immersion is for the educator who is comfortable using the basics of creating and recording and is ready to use Flipgrid to a greater extent.

One of the Flipgrid features allows educators to add a "copilot," a second educator or guest to the grid to utilize all of the educator features. This feature is ideal for co-taught classrooms with two educators or a guest speaker/content expert or a teaching assistant. Two educators are then able to adjust settings, respond to students' videos, give feedback, and complete rubrics. This feature allows for collaboration among faculty or the ability to add an instructional designer or faculty liaison that can assist the faculty member as he or she adjusts to using Flipgrid in the classes.

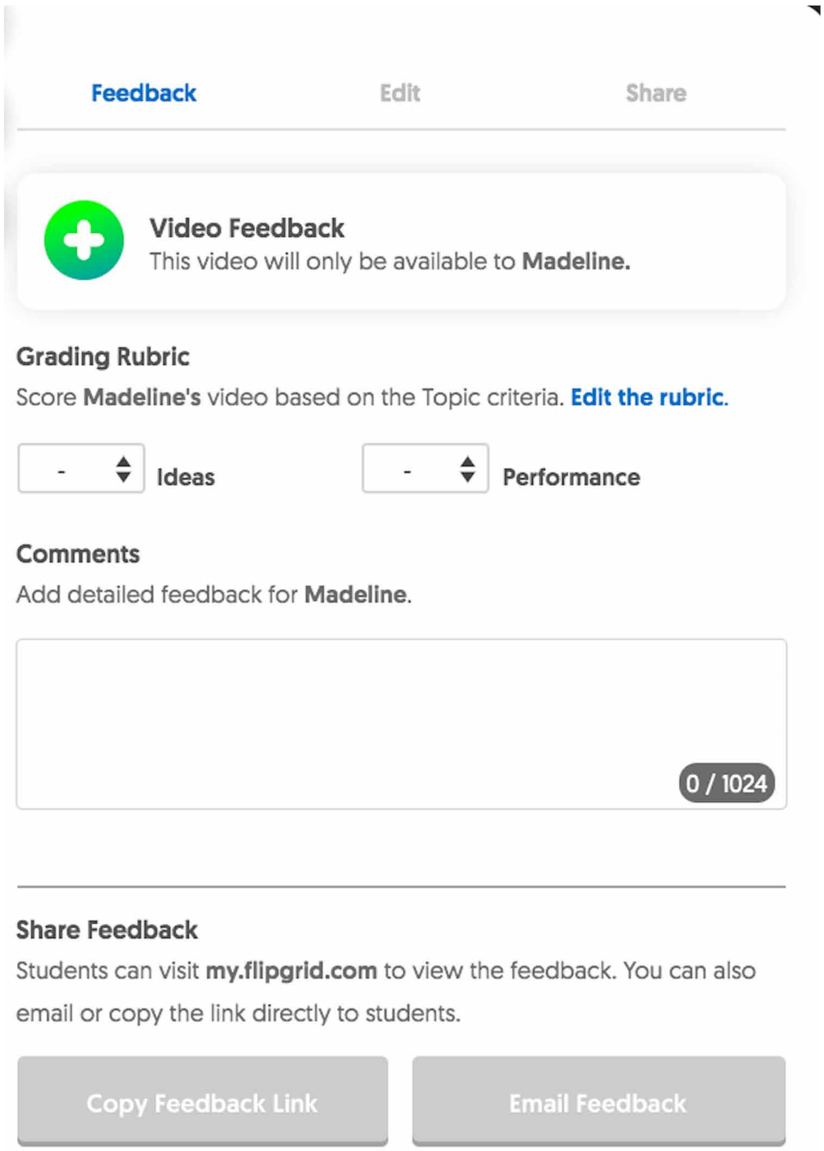
Chickering and Gamson (1987) stated the importance of giving students prompt feedback: "No feedback can occur without assessment. But assessment without timely feedback contributes little to learning" (p. 4). Prompt and quality feedback can be given more easily with two instructors or an instructor and teaching assistant. Flipgrid topics facilitate giving private feedback to students on their videos. There are two options: basic or custom feedback (see Figure 8). The basic feedback option includes two rubric elements (ideas and performance) on a six-point scale of 0 to 5, with the option to include written comments. The custom option allows the educator to build and assign custom feedback rubrics based on the particular needs of one's classroom. The educator creates a criteria title, description, and minimum and maximum score for each criteria item, thereby creating a customized rubric by which to assess each student's video. Providing clear expectations and an articulated rubric to students should result in quality assignments.

Feedback on videos might include comments on the content or presentation skills. In a recent use of Flipgrid, the author worked with a faculty member who used the feedback feature to comment on the communication skills of English-language learners to assist them with their pronunciation of certain difficult words and phrases in the English language. Feedback is an important aspect of teaching, in order to improve students' skills and knowledge.

Another feature that a user at the Movement level might engage in is to contribute to the Disco or Discovery Library. Educators can easily share their topic ideas in the library so others can freely access and use their topics (see Figure 9). Student responses are not shared in the Discovery Library. When contributing to the Library, the educator must indicate the audience, the topic subject, and the goal of the topic. This way, others can easily locate an existing topic that they might use with their own students. The Discovery Library serves as an open educational resource for educators to openly share their creative ideas for using Flipgrid with their students. The Discovery Library has a variety of content areas but in particular has a wide selection of ice-breaker topics available to get to know the students, which is an important aspect of teaching and learning.

More immersive sharing features are available on Flipgrid for those wanting to do more than just get their toes wet in this educational technology. Flipgrid allows for one-click sharing of a topic to Google Classroom or Remind. Google Classroom serves as a learning management system for many educators, and Remind is a communication app that teachers can use to send text messages to students without revealing their cell phone number. With the click of a button in the sharing feature, educators can add a Flipgrid to Google Classroom for students to complete or send a link of a Flipgrid topic to students' cell phones using the Remind app. A recent study by MIT's Abdul Latif Jameel Poverty Action Lab concluded that using text-based messages, such as the Remind app, has a meaningful impact on student educational outcomes in a very affordable way (J-Pal Evidence Review, 2019). Connecting students with their Flipgrid assignments is an easy and efficient way to have them achieve the learning objectives. In

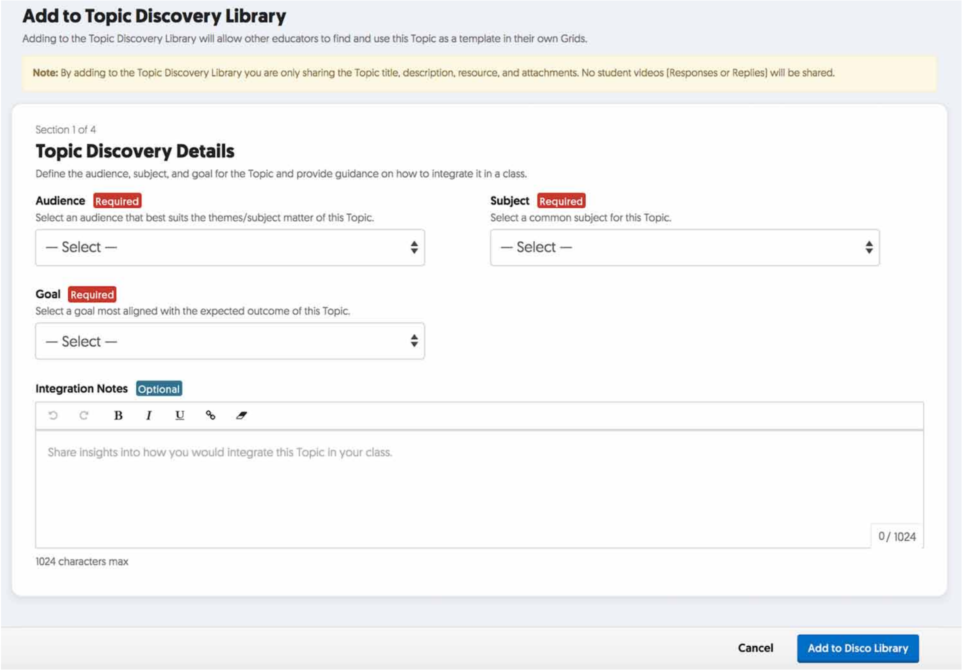
*Figure 8. Feedback and Rubric Options*




addition, Flipgrid can be embedded in other websites that accept an embed code. When embedding the grid into the college's learning management system, students can seamlessly create their videos without leaving their online course.

Last, once Flipgrid users are more familiar with the technology, they might want to move or duplicate video responses. An educator may decide to create a grid for just one student to share all of his or her thinking on a particular project. Flipgrid allows the educator to move that one video response to its own topic or to duplicate the video response so there is a new topic for others to then comment on. Because each video response has its own URL, individual responses can be shared with parents, administrators, authors, or experts. These video responses, as well as the selfies, can also be downloaded and shared.

*Figure 9. Adding to the Discovery Library*




Of course, the sharing of responses should occur only with the permission of the student or parent (Flipgrid, 2018c). An individual student video can also be used to initiate a new topic. By using the "spark response" feature, any video can be used to create a new topic in order to extend the discussion (see Figure 10). This allows instructors to value their students' responses and let them lead the next Flipgrid discussion. As in many face-to-face discussions, at times the discussion takes off in a new direction and this feature allows the instructor to "spark" a new topic and have students follow it.

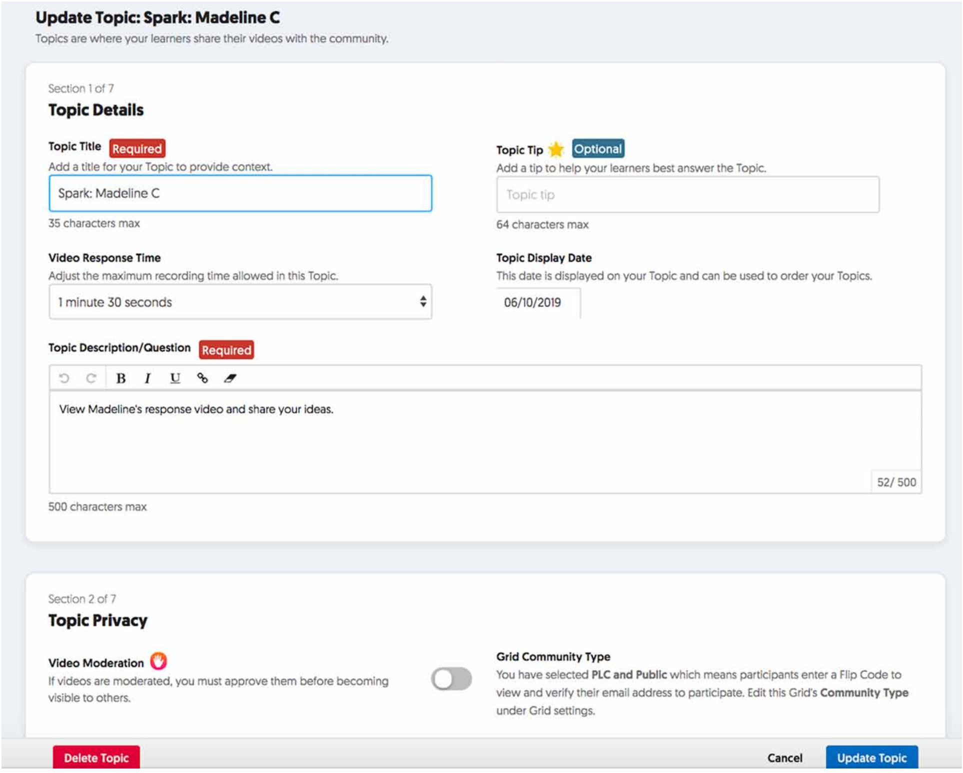
In a recent Flipgrid discussion on the history of education, this author observed in the students' videos that students seemed very interested in specifically discussing the current state of school segregation. Using the spark feature, this author was able to spark one student's video into a new topic, thereby continuing the discussion in a new topic. Sparking helps create a community of learners as does the more advanced Flipgrid features found in the next level of immersion: Submersion.

## Exploring Level Three: Submersion

The last level of immersion is Submersion. Submersion has educators diving in by exploring features well beyond the basics, including connecting classrooms globally using *Gridpals*, creating *MixTapes* as a compilation of student voice, and creating scavenger hunts called "*Fliphunts*." In addition, educators can appsmash, engage in the #flipgridfever Twitter community, become a certified Flipgrid educator or ambassador, earn badges, and take advantage of Flipgrid's accessibility features.

*Fliphunts* is another creative way to use Flipgrid. A *fliphunt* is a digital video scavenger hunt created by Kathi Kersznowski, tech coach from New Jersey (Erwin et al., 2019). Educators connect their learning objectives to tasks and create a list of these tasks that students must demonstrate completion in

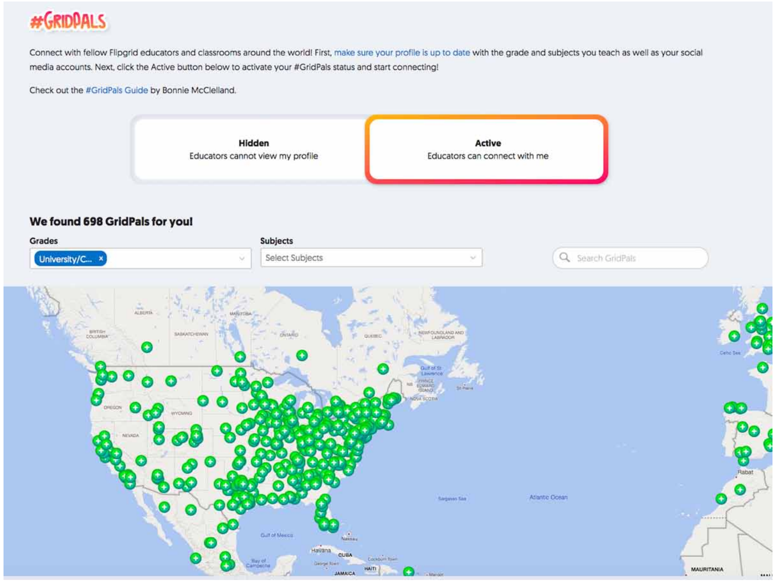
Figure 10. Sparking a student's video into a new topic




Flipgrid's video format. This type of activity starts with learning outcomes but encourages creativity, fun, and student engagement. This author used this scavenger hunt in a first-year orientation course to have students become familiar with the physical and technological layout and access to the college library and its available resources. Students were given a list of items, articles, and places in the library. They were instructed to record a video of themselves or take a photo of their group either in that particular room of the library or with a description of an item and how they went about locating it. The list included items such as a scholarly article from an education database, a quiet study room, the "ask a librarian" feature on the library website, and the reserve desk bell. Other examples of Fliphunts may include locating and explaining shapes and angles for a geometry lesson and explaining the location of body parts for a skeletal system lesson (Kersznowski, 2018).

Another engaging and submersive way of using Flipgrid is to sign up for *Gridpals*. *Gridpals*, an electronic form of penpals, was created by Bonnie McClelland, an instructional coach from New York. According to Flipgrid (2019), there are over 10,000 educators registered on *Gridpals* as willing to match up with another class anywhere in the world to connect through video (see Figure 11). Matches on *Gridpals* can be made by grade and by subject so as to make an appropriate link of classrooms and/or educators. More information on how to use *Gridpals* can be found in the #GridPals Guide (McClelland, 2018). The copilot feature mentioned previously came out of the *Gridpals* initiative so that educators across the world or country who have never personally met can share a grid of their students' responses to one another. Although this feature is designed to connect K-12 classrooms, it can also be utilized in college courses for students to connect with other college students across the country or the world.

*Figure 11. GridPals Feature Identifying Available Connections Worldwide*

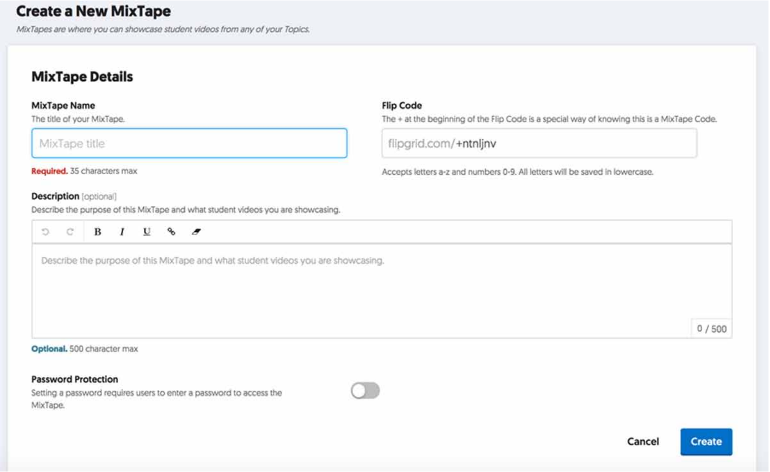



Recently, this author connected teacher-preparatory programs from New York and Colorado to share differences in teacher training, salaries, and working conditions. Building national and international connections among classrooms can serve as a strategy for culturally responsive pedagogy to develop more open-minded and informed citizens (Ladson-Billings, 1995).

Diving deep into Flipgrid provides opportunities for instructors to earn titles and badges related to Flipgrid use. There are three levels of certified educator available as well as ambassador status and the earning of a variety of badges for using Flipgrid and contributing to the Discovery Library. Overall badge achievements include Flipgrid Community, Grid Creation, Total Videos, Engagement Time Across Grids, and Topic Discovery Library. Educators can choose to complete tasks to apply and become a Student Voice Ambassador, who is involved in improving Flipgrid and receives some nonmonetary benefits. There are also three levels of certified educators: Level 1, Level 2, Level 3, which earn educators badges for their Flipgrid expertise. Through electronic badges, these small professional-development opportunities help improve and demonstrate educators' skill and knowledge of Flipgrid (Flipgrid, 2018a).

*MixTapes* is one of the newer Flipgrid features, which is sort of a throwback to the audiotapes of the 1980s in which users made their own music cassettes. This feature allows educators to combine videos from different grids and topics to create their own arrangement of videos (see Figure 12). By creating a MixTape and then adding individual student videos to it, educators can create their own "best of" collection in student response videos. A MixTape can be used to communicate high expectations of students: "Expecting students to perform well becomes a self-fulfilling prophecy when teachers and institutions hold high expectations of themselves and make extra efforts" (Chickering & Gamson, 1987, pp. 4-5). Recently, this author used the MixTapes feature to combine the videos of her students reading poems to share their learning on culturally relevant pedagogy from two sections of the same class. This MixTape of poems can now be viewed from start to finish in one grid and can be downloaded to share with future students. Once permission is received from students to share the videos, MixTapes demonstrate student learning and content outcomes.

*Figure 12. Creating a MixTape*




The latest feature built into all Microsoft learning tools, including Flipgrid, is called Immersive Reader and is a good example of effective Universal Design for Learning, which suggests that teachers can remove barriers to learning by providing flexibility in materials, methods, and assessments (Meyer, Rose, & Gordon, 2014). Flipgrid's (2019d) blog post titled "Immersive Reader comes to Flipgrid" states "Whether a learner is dyslexic, an early or struggling reader, an ELL student, or simply needs a little assistance, Immersive Reader makes reading and understanding easier" (para. 1). To use this tool, Flipgrid users need to click the Immersive Reader icon, which looks like a book with an audiovisual in the corner (see Figure 13).

The Immersive Reader tool allows for the reading of text by word or line highlighting, adjustment of the text size, and alternate spacing and color of the text selection. Readers can also turn on a feature that color-codes and labels parts of speech and syllables in words, shows a picture dictionary, adjusts the number of lines to improve focus, and translate the text into another language (see Figure 14). This submersion feature provides access and engagement to all learners, which is important in higher education classrooms but especially in online classrooms.

*Figure 13. Immersive Reader Feature Icon*

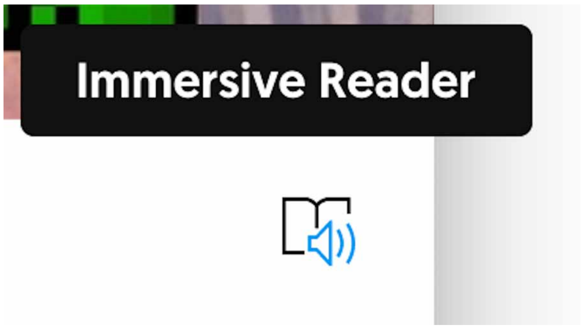
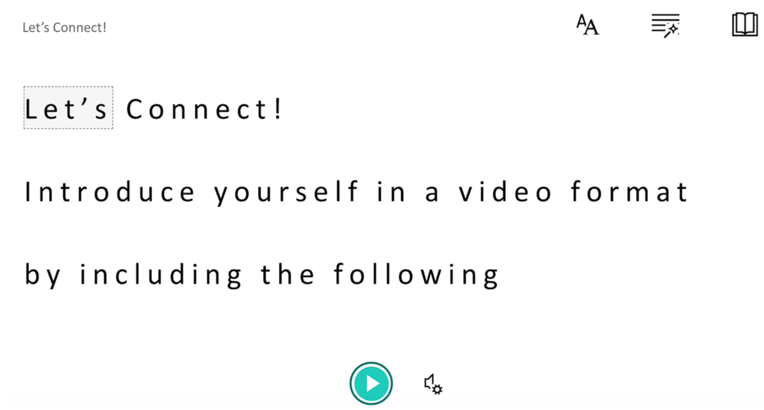


*Figure 14. Example of an Immersive Reader Feature*




Last, the features of Flipgrid can be greatly enhanced through appsmashing. Appsmashing is combining more than one application to create an innovative way to use the technologies. Smashing most any another app is possible with Flipgrid due to the embed feature discussed earlier. But for March Madness, Flipgrid held a contest of appsmashes on Flipgrid.com called "Flipgrid Appsmash Madness 2019." The top four included engaging activities. The first one smashed Google MyMaps, a mapping tool that shows street views and allows for the creation of personal maps; and Screencastify, a screencasting Google Chrome extension, with Flipgrid using Gridpals to connect students across the world and have them describe their communities. The second one appsmashed Microsoft OneNote, a note-taking tool, with Flipgrid to use for lesson planning. The third combined artificial intelligence technology, specifically 3DbearAR with Flipgrid, to provide practice in math and writing skills. The last top four appsmash was PearDeck, a student-engagement presentation tool that contains assessment options, with Flipgrid allowing student voice embedded in a PearDeck interactive presentation. The many options that appsmashing provides tends to extend the Flipgrid engagement beyond video creation into new and exciting realms of student learning and collaboration (Flipgrid, 2019b).

Submersion is the ultimate level of Flipgrid immersion, as it is able to capture all the new and exciting features frequently released by the Flipgrid innovators. Flipgrid makes a practice of listening and responding to users' comments and feedback to grow, learn, and improve. They host Flipgrid conferences regularly in Minnesota, and at the annual ISTE (International Society of Technology Educators) conference, that included not only product updates but also singing, dancing, and cheering. Responding to users' needs in an engaging manner and being a strong, supportive presence on social media, especially on Twitter, has been a big part of the Flipgrid success story.

## LIMITATIONS OF FLIPGRID

Although Flipgrid offers many benefits and features, it also has several limitations. The first limitation is its privacy settings. Part of Common Sense Education's mission includes the clarification of privacy policies of EdTech tools. The privacy evaluations were designed with the involvement of more than 150 schools, districts, software developers, and privacy experts. The privacy ratings use a full 150-point privacy evaluation of that product's terms. Flipgrid received an overall rating on a full privacy evaluation of 50 out of 100; this corresponds to the privacy evaluation tier of "use responsibly" which Common Sense Privacy Evaluation indicates "meets our minimum requirements for privacy safeguards, but more research should be completed prior to use." The other two lower tiers are "use with caution" and "not recommended." Therefore, Flipgrid met the requirements of the highest tier but its lowest score was in the *safety* category for a score of 38 out of 100. "Evaluating safety takes into consideration best practices that protect a user's physical and emotional health" This rating is low because Flipgrid's policy enables "grid owners" to control content through privacy settings, password protection, and the moderation of the grid. Therefore, safety is dependent on the grid owner who determines what is public and therefore may allow videos to be posted to Social Networking Services such as Facebook or Twitter (Common Sense, 2019).

The second limitation is that all videos are based on educational technologies, although many individuals might be averse to recording themselves due to shyness, fear of embarrassment, lack of confidence, or inexperience with the medium. Flipgrid offers advice to help the "camera-shy" students. Instructors can moderate the videos so only the instructor can view the videos and not classmates. Instructors may permit students to cover the camera and just record their voice, or they might record an inanimate object. Students might record in groups, which might ease a student's stress. Also, appsmashing might assist by allowing students to screencast or use an animation app such as Chatterpix to express their thoughts through a cartoon character (Erwin, 2017). A soon to be released new recording feature will also assist those shy students.

The third limitation of the tool may be the time-consuming nature of viewing and assessing videos. As stated previously, videos can be as short as 15 seconds and as long as 5 minutes. To assess higher order thinking, students might need considerably more time to express themselves. In a class of 25 students, each with 3-minute videos, that is 75 minutes of viewing time. If students are asked to respond to other classmates' videos for a video discussion, students and instructors would be spending a considerably greater amount of time on Flipgrid. An instructor might consider breaking up the class into smaller groups in a topic so that at least the student does not spend an exorbitant amount of time viewing videos but the instructor still has the responsibility to watch all students' videos and potentially assess all of them for the learning outcome.

The fourth limitation of using Flipgrid is the lack of integration with most learning-management system's gradebooks except for Canvas and Google Classroom. With Canvas, there is an LTI integration for Flipgrid and therefore students can be graded on Flipgrid assignments using Canvas's SpeedGrader feature (Flipgrid, 2019a). This seems to be only the case for the Canvas LMS through the LTI and Google Classroom through the share feature. There is no integration for other common LMSs such as Blackboard Learn, Moodle, or D2L Brightspace. If using one of these LMSs, student usage must be tracked and assessed in Flipgrid and then entered manually in the LMS's gradebook feature. This can be very time consuming, especially for large classes. Flipgrid does provide an embed code for each grid and topic that will allow the students to watch and/or record videos without having to leave the desired page in the LMS.

The fifth limitation is the potential distractive nature of the Flipgrid tool. Kolb (2017) stated that when measuring the engagement aspect of a technology tool, one must ask the question, "Does the technology allow students to focus on the assignment or activity with less distraction?" which she refers to as "time-on task" (p. 45). Although Flipgrid is certainly high on the engagement scale, the tool itself has the potential to be distracting to learners because of many sticker options that can be placed on the selfie after recording the video. There are now hundreds of stickers available, including a new set of emoji stickers as well as masks, hats, subjects, and compliments. For many students, especially younger students, these stickers can be a time waster. Fortunately, instructors can turn off this option in the grid settings. The other distracting element of Flipgrid is the video-recording aspect because some students spend an exorbitant amount of time to make sure they look perfect in their video, and this can distract from the learning and time-on task (Kolb, 2017). Instructors are encouraged to provide examples of videos and a clear rubric as to what aspects of the Flipgrid discussion will be assessed. This way, students are aware if instructors are assessing the content of the discussion and/or their presentation skills and can therefore gauge the amount of time that should be spent on preparation before creating their video(s).

The limitations of using Flipgrid are few but must be acknowledged to provide a comprehensive view of this educational technology tool. Institutions may identify other limitations based on their own policies and procedures.

## FUTURE RESEARCH DIRECTIONS

More research needs to be conducted on the impact of student-created videos on student learning. Much of the research is on teacher-generated videos for use in flipped classrooms in traditional, blended, or online learning and on the general benefits of using screencasting primarily by the instructor. The explosion of YouTube over the past 15 years demonstrates an interest in this medium for entertainment as well as for learning purposes. When people need to learn how to fix, set up, or complete a task, they frequently turn to the over 1.9 billion users on the YouTube platform (YouTube, 2019). With this statistic growing larger each day, the future seems to be in video. Therefore, research is needed to measure the learning outcomes of students who generate their own content in video format for learning purposes.

Future research can broadly examine the use of video or the many educational technologies arising daily that use video as a key component of learning such as Flipgrid but also Explain Everything, Educreations, Doceri, Powtoons, and others. Educational technology companies have a responsibility to not only create these technological products for learning but also to measure their impact in systematic ways so as to provide transparency to users and potential purchasers of their products. Instructors should use available resources to evaluate the technology such as Common Sense Education (commonsense.org/education), EdSurge (edsurge.com/product-reviews), and edshelf (edshelf.com; as cited in Kolb, 2017). In addition, educators should use available research-based frameworks such as the Triple E measurement tool found on the Triple E Framework website (tripleeframework.com; Kolb, 2017).

A recent study by the Abdul Latif Poverty Action Lab reviewed the evidence from 126 studies of educational technology and found many interesting yet conflicting results. Initiatives to bring devices into schools did not improve student achievement but did increase students' computer proficiency. Educational technology designed to build specific student skills showed "enormous promise in improving learning outcomes, particularly in math" (J-Pal Evidence Review, 2019, p. 2). As previously mentioned, technology reminders used in educational settings saw positive impacts on learning. The study ultimately calls for more research in educational technology in terms of the extent to which these tools increase student learning without increasing the achievement gap. Future research must consider the diversity of the student body population and how technology may or may not affect the wide array of diverse students such as in race and ethnicity, socioeconomic status, gender, and disabilities.

## CONCLUSION

Student engagement is key to improving instruction in higher education. The use of educational technology in all types of higher education classrooms can provide that sense of active learning, cooperation, diversity of ideas, challenges, and feedback needed to make effective change happen. Video-response tools such as Flipgrid incorporate all of Chickering and Gamson's (1987) seven practices: encourage faculty-student contact, cooperation among students, use of active-learning techniques, time on task, the communication of high expectations, and respect for diverse talents and ways of learning. The three levels of Flipgrid immersion of acclimation, movement, and submersion provide a framework for educators to gradually learn and utilize this diverse educational tool that allows for every student to contribute and be heard. Educators can utilize the various Flipgrid features to implement best practices into their traditional, blended, and online classrooms and improve student outcomes.

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## KEY TERMS AND DEFINITIONS:

**Appsmashing:** When two or more technologies are combined for added benefits.

**Flipgrid:** A video-response educational technology tool available through Microsoft's suite of learning tools.

**Fliphunt:** A type of digital scavenger hunt using Flipgrid video responses (created by Kathi Kersznowski).

**Grid:** The term used by Flipgrid for the category that houses videos assignments such as course name or course number.

**Gridpals:** The network created among Flipgrid users to find other Flipgrid-using classes for collaboration and learning (created by Bonnie McClelland).

**MixTapes:** A compilation of student-video responses created by the instructor in Flipgrid.

**Student Engagement:** Methods to motivate students to achieve the intended outcomes.

**Student-Generated Videos:** Videos created by students for learning purposes.

**Teacher-Generated Videos:** Videos created by teachers for learning purposes.

**Topic:** The term Flipgrid uses for the assignments within a grid.

# Chapter 12
# Rethinking Flipgrid and VoiceThread in the Context of Online Collaborative Learning Theory

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## ABSTRACT

*In this chapter, Harasim's online collaborative learning theory (OCL) will be addressed as it explains how collaborative learning takes place in online environments via the use of online collaborative tools. Preliminary studies on using FlipGrid and VoiceThread, discussion tools which incorporate dynamic media such as audio and video, will be explained in the context of how such collaborative media tools can foster student engagement and collaboration. Implications of using these online tools and how they contribute to collaborative learning practices will be discussed in the context of OCL theory.*

## INTRODUCTION

Student interaction and engagement play a key role in face-to-face classes, and previous literature has shown that engaging classes result in positive learning experiences (Furlong & Christenson, 2008). Interactions in online learning environments are successful to the extent which they could mimic real-life learner interaction by fostering conversations relevant to the content (Hew, 2012). Learners' interaction with their peers and instructors have become increasingly common as educators advocate for social learning practices in 21st-century classrooms. Discussions, interaction with peers, and meaningful exchange with the social community can foster learning and engagement (Bandura, 1977; Vygotsky, 1978). Educators strive to create engaging online learning environments in which students will be able

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to exchange ideas with one another (Hew, 2012). Collaborative learning practices are the products of such efforts, and collaborative learning promotes the exposure to diverse viewpoints of other learners, which, in return, help students form their own unique conceptual frameworks as opposed to acquiring information from a textbook or a static source of information (Smith & MacGregor, 1992).

In most online classes, such interaction and collaboration take place asynchronously — not in real time when an actual conversation is taking place (Romiszowski & Mason, 2004). Asynchronous communication is used as an effective tool for critical thinking and reflection (Green & Green, 2018; Zhang et al., 2007). The nature of asynchronous communication is usually text-based and almost all asynchronous discussions require typing (Girasoli & Hannafin, 2008). However, asynchronous interaction has its own shortcomings such as increased difficulty for students who are less proficient in writing (Bowe, 2002), cognitive load when the students type and participate simultaneously in a discussion (Arend, 2009), and potential misunderstandings due to lack of verbal cues and gestures (Hew & Hara, 2009). Text-based discussions also have less motivational appeal to students in comparison to face-to-face discussions (Angelino et al., 2007). As a result, alternative media such as interactive multimedia have become more popular for their potential affordances (Koricich, 2013). Audio (Akasha, 2011; Bruvand & Byrd, 2011; Hew, 2012) and video (Green & Green, 2018) as alternative forms of media can be incorporated into online asynchronous interactions in online or blended classes.

In this book chapter, Harasim (2012)'s online collaborative learning Theory (OCL) will be explained as OCL serves as a theoretical foundation on how collaborative learning takes place in online environments via the use of online collaborative tools. A discussion around the use of Flipgrid and VoiceThread (discussion tools which incorporate dynamic media such as audio and video) in recent literature for instructional purposes in online and offline settings will reveal how the existing practices relate to OCL; specifically, how the use of these tools allow students to collaborate with each other from a pedagogical perspective. These two specific technology tools were chosen to be discussed in this chapter given the increasing adoption of these tools by online instructors (Hurlbut & Dunlap, 2019; Young, 2017).

## BACKGROUND

Collaborative learning is based on the idea that knowledge is constructed socially. Social constructivist theory of learning (Vygotsky, 1978) serves as the foundation for collaborative learning. Lev Vygotsky believed that social interaction is essential for the student's learning process along with a personal critical thinking process (Hmelo-Silver, Chinn, Chain, & O'Donnell, 2013; Powell & Kalina, 2009). According to the social constructivist theory of learning, individual subjects are not separate from their society, but instead, an individual and the society he/she belongs to are inherently interconnected. Social interaction enables learners to pick up and learn new ideas and concepts with the help of more knowledgeable peers or adults (Woo & Reeves, 2007). Woo and Reeves (2007), originally cited in Brown, Collins, and Duguid (1989), put a specific emphasis on the authentic nature of social interactions in which such learning takes place. In order for learning to occur, it is important that a learner is situated in a situation that is relevant to real-life experiences and which takes place in an environment similar to an applied setting.

*In particular, if students work together with other people including peers, experts, and seniors while solving an authentic task, this approach highlights the emphasis social constructivists' place on the construction of knowledge through mediation and negotiation within a learning community. It also* *highlights the process of working closely with an expert who provides a model and gradually socializes the student into the culture of the profession or field (Woo & Reeves, 2007, p. 20).*

Collaborative learning has long been known as an effective, pedagogical approach; however, the introduction of new and online technologies of learning provided new opportunities for student collaboration and collaborative work (Palloff & Pratt, 1999; Roberts, 2004; Stephenson, 2018; Wang et al., 2017). The new technologies further complicated the nature of collaborative activities and how they should be designed to create effective learning experiences. Based on the definition of socially constructed learning as such, the idea that a person's learning may be enhanced through his/her interaction with others, technology-supported online collaborative learning can offer new possibilities of working together and learning from others.

## Online Collaborative Learning Theory (OCL)

In the current Knowledge Era, the growth of the Internet and the learning technologies has accelerated the speed of knowledge creation today. Though the existing theories such as collaborative learning and social constructivist theory of learning are still relevant, new theories of learning are needed to explain the new era of learning through technology. In this regard, online collaborative learning as a continuum of collaborative and constructivist theories of learning adds on knowledge-building practices in the 21st-century educational practices.

*Online Collaborative Learning Theory (OCL) is proposed here as a new theory of learning that focuses on collaborative learning, knowledge building and Internet use as means to reshape formal, nonformal and informal education for the Knowledge Age. OCL responds to 21st century Knowledge Age requirements and provides a theoretical framework to guide the transformations in instructional design. (Harasim, 2012, p. 81)*

"Online collaborative learning pedagogy", "online technology tools that facilitate collaboration" and "online collaborative learning environments", are central to the online collaborative learning theory and constitute the three main components of the theory.

1. **Online Collaborative Learning Pedagogy:** The online collaborative learning pedagogy is mainly about learning through meaningful collaboration and conceptual change, in other words, learning processes that occur as a result of collaborative activities. Harasim (2012, p. 96) divided the collaboration process into four main stages:

    a. Idea Generating
    b. Idea Organizing
    c. Intellectual Convergence
    d. Final Position

In the *Idea Generating* phase, learners share their own opinions by generating ideas and brainstorming about a subject. This is the stage where learners present their ideas on a predetermined topic or subject. In the *Idea Organizing* phase, students interact with one another; they are exposed to new ideas of their peers. "Learners begin to organize, analyze, and filter the range of ideas by agreeing or disagreeing with some of the ideas presented, elaborating, expanding, or rejecting others" (Harasim, 2012, p. 96). In comparison to phase one, in this phase of the online collaboration, learners' perspective of how the topic can be approached from many different viewpoints is expanded due to the diverse input from other peers and the instructor. In the third phase, *Intellectual Convergence*, learners come to a position on a topic or resolution to the knowledge of a problem. After exchanging ideas on a topic, in this stage, learners reach a consensus or solidify their position, which can be presented as a report, final paper, group presentation, or summary. The *Final Position* phase refers to a conceptual change that happens in learners' minds as a result of the interaction and input in the previous stages of collaboration.

2. **Online Technology Tools:** The online technology tools that enable such knowledge exchange is also an important part of OCL Theory. Online learning tools are "web tools that can facilitate or enable particular tasks in a learning activity" (Harasim, 2012, p. 98). These tools can range from web tools to education-specific tools. These tools provide means for communication— in other words, they enable the pedagogical practices of collaborative learning in online environments in diverse ways. Collaborative learning can be facilitated in many ways, and it is contingent upon the technology tool the instructor uses and the pedagogy that the instructor wants to build the learning experiences around.
3. **Online Learning Environments**: Online learning environments refer to "web-based software that is designed to host or house learning activities" (Harasim, 2012, p. 98). These environments are not just channels for transmitting information, but in these environments, participants negotiate the meaning and engage in conversations with each other (Harasim, 2012). Some common environments are group-discussion boards and computer conferencing systems. These environments facilitate place-independent, time-independent (as well as synchronous), Internet-mediated, many-to-many (as well as one-on-one) and text-based (with multimedia) discourse (Harasim, 2012). In such environments, factors such as place and time are not limiting, but rather learners have more opportunities to participate in any time and in any place that they prefer. The other factors that characterize these environments are the extent to which these environments facilitate group conversations as well as one-on-one interaction, and communication can take place with text and some elements of multimedia.

In OCL Theory, the term *collaborative* serves a very important purpose. Collaboration is highlighted not only because it enhances the learning outcomes, but also "reduces the potential for learner isolation that can occur in a learning environment" (Palloff & Pratt, 2005, p. 8). Through learning together and learning from each other, students have the chance to extend their initial knowledge about a subject and receive constructive feedback from others (Jeong & Hmelo-Silver, 2016). Going back to the continuum of learning theories, it is possible to see that collaboration and social interaction are not novel ideas, but they were rooted in fundamental learning theories such as in Vygotsky's Zone of Proximal Development Theory (1978). Similarly, online tools should not only be viewed as products of some novel or complex technology but rather, these tools are used to re-enact and mimic the-face-to-face interaction and learning practices in the absence of synchronous communication between instructors and students.

## OCL Theory: Affordances of VoiceThread and Flipgrid as Potential Collaboration Tools

Flipgrid and VoiceThread are two technology tools, which are commonly used in learning settings to either supplement classroom learning or foster interaction in asynchronous distant communication. These specific tools allow users to create interaction through using multimedia though there are other technology tools can also be used for similar purposes (i.e. Microsoft PowerPoint, Microsoft Sway, Monosnap, Vocaroo, Screen-o-Matic, voice board feature in Blackboard). Within the scope of this chapter, only Flipgrid and VoiceThread are discussed in detail as asynchronous collaboration tools.

"Flipgrid is a video discussion platform designed to allow students to quickly engage in recorded conversations that include video and audio" (Green & Green, 2018, p. 128). The instructor usually has an account for Flipgrid and students can access the discussion platform through a unique hashtag or link (McClure & McAndrews, 2016). "Requirements for creating a grid topic include a title, video response time (ranging from a minimum of 15 seconds to a maximum of 5 minutes), topic description (question or prompt), and a date" (Dettinger, 2018, p. 212). Instructors first create a grid, which can be considered as an equivalent of a discussion forum for a specific class. The grid houses topics for the discussions created for the course (Green & Green, 2018). Within each grid, it is possible to create a number of topics for discussions.

One of the reasons Flipgrid can be an alternative tool to text-based discussions is that through Flipgrid, it is easier and more natural to share thoughts or ideas through videos as young people can feel more comfortable sharing audio and video formats of a discussion instead of a written one (Iona, 2017).

Another tool found to promote engagement and community learning, particularly in online education, is VoiceThread (Kirby & Hulan, 2016; Stamps & Opton, 2019). Though VoiceThread is not primarily intended to be an educational tool, it is mostly used by educators (Berman, Holsing, Meyer, Stubbs, & Winck, 2009; Borup, West, & Graham, 2012). VoiceThread is an interactive communication tool that allows voice, video, and text commenting (Rad, 2007). It is similar to Flipgrid as it also allows video commenting, but the tool has a different interface. To use VoiceThread, a user needs to upload a file (i.e. image, video, PowerPoint presentation, PDFs) and then creates a video or audio narration, which are combined with the uploaded files (Borup et al., 2012). Users can also comment on others' videos by using text, audio, or video (Borup et al., 2012).

*Figure 1. A screenshot from Flipgrid's grids menu (educator view)*

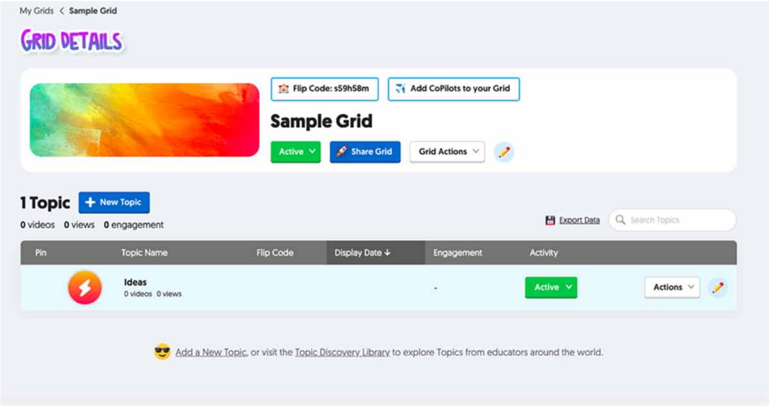


*Figure 2. A screenshot from VoiceThread's discussion panel*

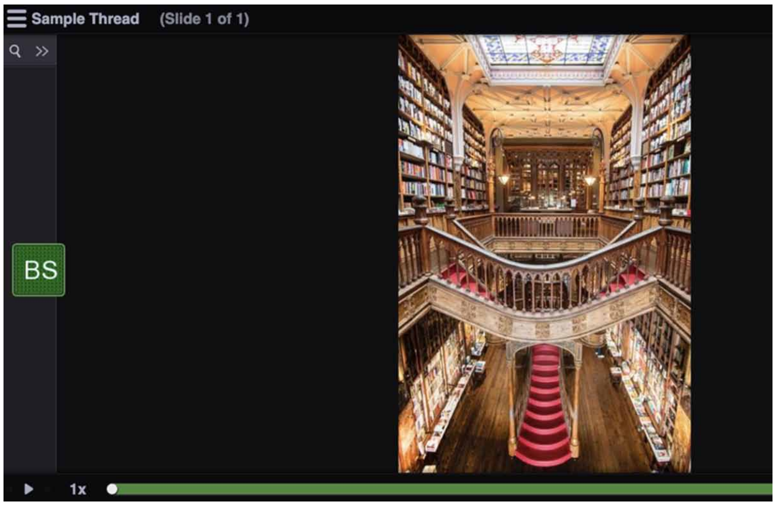
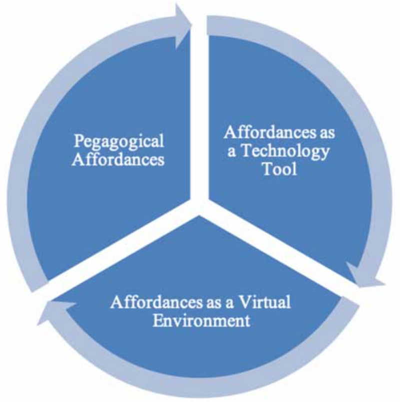



*Figure 3. Affordances of Flipgrid and VoiceThread as online collaboration tools*




The uses Flipgrid and VoiceThread for educational purposes can align with online collaborative learning theory. Online collaborative learning theory is based on three main pillars which together support learning collaboratively in online environments: online collaborative learning pedagogy, online technology tools, and online learning environments. Flipgrid and VoiceThread's affordances as potential educational collaboration tools can be explained through OCL theory.

1. **Pedagogical Affordances:** One of the problems in online or asynchronous learning practices is that good learning requires more than a shift from one medium to another but instead, sound pedagogical practices should be the foundation of online learning practices (Reeves, Herrington, & Oliver, 2004). While instructors try to adopt new technology and use it in instructional settings, pedagogical considerations are rarely given the much-needed attention. Herrington, Oliver, and Reeves (2003)'s description of the pedagogy of online collaborative activities include but not limited to examining a task from different perspectives, collaboration between students, and opportunities

for students to reflect on students' beliefs and values on subject of the study. Similarly, Harasim (2012)'s theory of online collaboration includes stages of collaboration such as idea-generating, idea-organizing, intellectual convergence and final position on a subject. Collaboration doesn't constitute of sharing ideas but also critical thinking and feedback on others' ideas and collaboration and more importantly, collaboration results in a change in one's world view (final position), either one's ideas are expanded or changed as a result of the intellectual convergence between the peers. Technology tools such as Flipgrid and VoiceThread can be incorporated into pedagogical activities to the extent that the use of these tools is combined with pedagogical considerations posed by OCL theory. The questions concerning the pedagogical aspect of the theory can be summarized as below:

a. Do learners brainstorm and create ideas or perspectives on a certain topic and share them with peers/instructors? (Idea-generating)
b. Are learners exposed to others' ideas on the topic? Do they have an opportunity to elaborate on, expand, or reject others' ideas within the context of collaborative learning? (Idea-organizing)
c. Do learners come to a consensus or have a solid idea as a result of the input of ideas from other peers? How do they come to such conclusions? (Intellectual convergence)
d. Does real learning or conceptual change happen as a result of a collaborative activity? (Final position)

The pedagogical affordances are closely aligned with the technical affordances these tools – specifically, the audiovisual interaction opportunities between peers and how these affordances are incorporated into collaborative activities in thoughtful ways to achieve learning objectives.

2. **Affordances as a Technology Tool:** The particular affordances of Flipgrid and VoiceThread stem from the opportunities for various audiovisual interactions between peers and instructors. The main reason behind the popularity of such tools is that the online learning conversation is being shaped around how to create student-student or student-teacher interactions that include a "human element", the equivalent of which often refers to communication involving audio and video elements. The inclusion of audio and video can help students recognize each other not only as some distant users of technology but as "humans" or "real people". In communications involving the use of audio and video, online students can record their voice or video messages for exchanging ideas (Ching & Hsu, 2015). In the past, audio/video messages for interaction and discussions were not widely used in classes including online classes (Ching & Hsu, 2015; Palloff & Pratt, 2007). However, audio and video interaction are becoming more popular in recent years for a variety of reasons such as communicating through text in online classes might not be a viable option all the time as misunderstandings can happen in the absence of face-to-face interactions (Hew & Hara, 2007). In addition, the use of interactive video can create opportunities for active learning (Baker, 2016; Jones-Roberts, 2018). However, one of the most important reasons behind the need for audiovisual (multimedia) interaction is ensuring that learners experience feelings of "social presence". Social presence is the idea that students can express themselves socially and emotionally in learning environments (Garrison, Anderson, & Archer, 2000; Holbeck & Hartman, 2018). In the absence of social presence, learners might have feelings of being lost and isolated (Clark, Strudler, & Grove, 2015; Palloff & Pratt, 2007). *Immediacy*, which is "the psychological distance that a communicator puts between themselves and the object of their communication" (Richardson & Swan, 2003, p.

69) and *intimacy* is referred as the level of intimacy expressed by verbal and non-verbal behavior (Rettie, 2003). According to Rettie (2003), immediacy and intimacy behaviors are related since immediacy behaviors (such as smiling, eye contact) are used to create intimacy and the resulting intimacy contributes to social presence. Lowenthal (2009) suggested that medium with a high degree of presence is regarded as sociable, warm, and personal (i.e. videos) in comparison to a medium with a low degree of presence (i.e. one form of media such as audio only). The particular technological features of these tools can contribute positively to the creation of social presence. Flipgrid fosters interactions which cannot be achieved in a written form of discussion or collaboration activity (Holbeck & Hartman, 2018). VoiceThread also allows users to interact in a way that is similar to face-to-face interactions. "Online collaboration using VoiceThread enables learners to see and hear their collaborators and helps make the collaboration process more engaging by emulating face-to-face interaction" (Ching & Hsu, 2013, p. 300). Such specific affordances could be effective in collaborative asynchronous learning activities.

3. **Affordances as a Virtual Environment:** A virtual environment allows for interaction between peers within a networked platform. Reeves et al. (2004) originally in Weigel (2002) suggested that virtual spaces also known as "knowledge rooms" should be constructed which would serve as meeting hubs for learners to engage in deep learning.

Both Flipgrid and VoiceThread are potential collaboration tools. However, the use of these tools and how they meet the pedagogical objectives are determined by the practices in the field. In this case, online collaborative learning theory could theoretically explain how collaboration takes place and how technology facilitates such learning practices; however, the real-life practices should be reviewed carefully to understand how these tools are being used and the pedagogical outcomes.

There is a huge gap between the theoretical ideal and the practical realization of these innovative approaches [authentic collaborative learning approaches], and effective models, principles, and guidelines are needed by faculty members, instructional designers, and academic administrators who are prepared to challenge the dominant teaching practices in higher education today (Reeves et al., 2004, p. 58)

In the next section of this chapter, recent applications of these tools in collaborative learning activities will be discussed in the context of online collaborative learning theory.

## CURRENT APPLICATIONS OF FLIPGRID AND VOICETHREAD

Flipgrid and VoiceThread are common technology tools which are used for asynchronous discussion or interaction between members of a learning community. The practice of using Flipgrid and VoiceThread is recent, so there is not an extensive body of studies which investigated these tools as a potential collaboration tool in online classes or learning environments.

Some preliminary studies investigated how Flipgrid can be used to engage students in asynchronous interactions (Bartlett, 2018; Hall, 2015, Johnson & Skarpol, 2018; Stoszkowski, 2018). It should be noted that not all studies used Flipgrid in online courses such as Stoszkowski (2018) and Johnson and Skarpol (2015). However, the results of all these studies required the use of Flipgrid for some sort of collaborative activity.

The results of a study conducted by Stoszkowski (2018) with thirty final-year undergraduate sports coaching students demonstrated that using Flipgrid has certain advantages in asynchronous collaborative interactions between students. In this study, the participants replied to an initial theme that was posted in grids, and they also replied to each other's posts.

The specific advantages reported were the inclusion of all students in content-relevant discussions, students' preference of watching others speak instead of reading long discussion texts, and easy access to grids by using a simple link.

Using Flipgrid can be helpful as the tool can potentially prevent students from feelings of isolation as students also realize there are other students like them who try to connect with others in an online class (Bartlett, 2018). Bartlett (2018)'s study focused on the effects of incorporating interactive video discussion forums into educational settings. She surveyed students to gather student perceptions on Flipgrid and how it affects student connectedness to a class and found that 92 percent of students (n=24) reported increased connectedness to the course, peers, instructors, and the program. In addition, it was found that students are more mindful of what they say in discussions because they are now talking to faces and not names on the screen (Bartlett, 2018).

Using Flipgrid in collaborative discussions could increase student interest and attention to peers' contributions. Hall (2015) used Flipgrid in her undergraduate AgriBusiness Law course with sixty students. Hall (2015) created three assignments that required the use of Flipgrid. The first assignment included student introductions through video, and the second assignment required students to create a video that explains a property rights conflict identified through research. In the third assignment, students were required to review those videos and pose a series of questions about those videos in a written format. One of the findings of this study showed that students found it hard to make three-minute videos for the second assignment (as there is a time limit for videos made through Flipgrid). When students were responding to others' videos with writing, they viewed an average of fifteen videos for this assignment, which showed students' interest and the level of engagement. However, it was reported that students' interest had a social nature rather than academic interest (Hall, 2015).

Flipgrid can also be used in educational activities that involve the use of non-traditional subjects such as visual arts (Johnson & Skarpol, 2018). Though not in an online classroom setting, Johnson and Skarpol (2018) investigated the effects of Flipgrid in student engagement and communication among secondary school art students. In their study, Johnson and Skarpol (2018) created an online assignment which required each student to create one video along with the requirement of responding to three classmates' videos. In their own video, students first introduced their artwork and then they analyzed and critiqued their friends' work by using "tell, ask, and give" feedback protocol. "They commented on what they liked about the piece of artwork, asked a question about the artwork, and gave a suggestion on how the student might improve their artwork" (Johnson & Skarpol, 2018, p. 16). During the post-test, 68% of the students indicated that using Flipgrid increased their communication with others, and 76% of the students indicated that they would like to continue using Flipgrid in the future. One of the findings of the study shows that previously shy students had more confidence in sharing their ideas with others through the video posts. Students also had to share high-quality communication when replying to their classmates by replying back and forth in order to have a meaningful digital conversation. Students indicated enjoying receiving honest feedback and at the same time, they appreciated the opportunity of giving others honest feedback. In addition, having the opportunity of providing video feedback enabled students to redo it when the recording did not meet their expectations, so they could improve their final feedback.

Preliminary studies on VoiceThread also demonstrate how the tool is being used for educational activities. Some studies investigated how using audio and video interaction through VoiceThread affected social presence and the creation of a virtual community. Borup et al. (2012) investigated how different instructors used asynchronous video on their courses and how this experience affected the perception of social presence in the course. The researchers selected three predominantly online sections of courses for their study and did a cross-case analysis of the selected online classes. One of the instructors involved in the research used VoiceThread for student presentations followed by his own VoiceThread presentations every week. The other instructor created a VoiceThread discussion explanation to orient students to assignments, to facilitate small group peer interaction, and to provide students with personalized feedback on completed projects. For this case, "the students were organized into small groups of 6-8 and received participation points for posting a video response to their group's private VoiceThread" (Borup et al., 2012, p. 17). The results of the case analysis revealed that having video communication with the instructor had a positive impact according to the students. The students also indicated video communication improved their understanding of the content as the instructor explained important points through video. The students' comments also showed that they developed an emotional connection to their instructor as the connection was similar to face-to-face interaction. The students also reported that communicating through video with peers felt more natural than text and improved the sense of the social presence of participants within these courses.

In her 2017 study, Delmas investigated how VoiceThread can be used to create a community for learners. An online Class Climate survey was administered to graduate students (n=39) to survey them on their experience with VoiceThread and how the collaborative tool contributed to an overall sense of community and connectedness between online learners. Survey results indicated that VoiceThread played a positive role in improving students' relationships with their classmates. One of the advantages of VoiceThread is that it allows recording and listening to audio files. Most students prefer audio interaction over text interaction. The students also reported getting to know their classmates better through sharing information in audio-visual interactions, though some students also reported that nothing can replace face-to-face interaction (Delmas, 2017).

Seery (2017) carried out research on using video discussions via VoiceThread. In this research, an activity was designed where students will talk about a hobby, an interest, or an area that they want to develop about themselves via sharing an image. Students initially have to share this activity with the instructor and with their classmates. Then, students had to comment on these VoiceThread posts. Though students were initially hesitant about creating an audio-visual discussion, the discussions helped the class to form closer bonds. The only issue was in the feedback portion of the study. When students were asked to give feedback to peers or make a suggestion for improvement, they were reluctant to do so. According to Seery (2017), the overall discomfort does not necessarily indicate a negative consequence but rather, it demonstrates that students are crossing a threshold as a part of their learning process since students are not used to having video discussions.

VoiceThread can also be used for audio discussions. Todd and Mulholland (2016), in a project where they combined visual arts with language education, asked language learners to comment on visual art images of different kinds. Through this activity, students would reflect their opinions about art, and they also would use the target language (English) in authentic contexts. Students chose a work of art and talk about it during an oral activity by using VoiceThread. Other students also provided commentary about chosen artworks. The results of the study indicated that students were eager to listen to their peers' opinions about the artwork and learned new vocabulary as a result of this activity. Students particularly liked the discussion because of its unique nature (i.e. inclusion of audio commenting) compared to other activities.

## Rethinking Flipgrid and VoiceThread in the Context of Online Collaborative Learning Theory

The preliminary studies on Flipgrid and VoiceThread demonstrate that these tools are promising for online interaction and collaboration though studies on more applications of collaborative activities are needed to be able to better define how such tools can be used in online collaborative activities.

As mentioned in the previous sections, the OCL Theory has three main components: "online collaborative learning pedagogy", "online collaborative learning tools", and "online collaborative learning environments". Online Collaborative Learning Theory, in this respect, provides a theoretical framework from three essential perspectives: the pedagogy level, the online technologies, and the environment that the learning takes place.

These components of the theory altogether explain how students can be encouraged and supported together to create new knowledge in new online learning environments (Harasim, 2012). Considering four stages of online collaborative learning pedagogy - *idea-generating, idea-organizing, intellectual convergence*, and *final position* put forward by Harasim (2012), the recent studies on these new collaborative tools can demonstrate how the collaborative pedagogy is applied in practice.

Despite the fact that the recent studies evidently engage students in idea-generating (Bartlett, 2018; Borup et al., 2012; Seery, 2017; Stoskowski, 2018; Hall, 2015; Johnson & Skarpol, 2018; Todd & Mulholland, 2016) and idea-organizing phases (Bartlett, 2018; Seery, 2017; Stoskowski, 2018; Hall, 2015; Johnson & Skarpol, 2018; Todd & Mulholland, 2016) in collaborative work between students relevant to the learning content, there is still little evidence on how such audio and video discussions lead to meaningful learning and asynchronous collaborative conversations. In these recent studies, the educational activities initially require students to post their ideas or reflection of a certain topic (idea-generating phase). Students are then required to comment on or view others' posts (idea-organizing). The initial studies, however, are not quite clear on how these tools can be useful in further stages of collaborative development such as intellectual convergence, where learners solidify their position (ideas on content) and present their findings. More importantly, it is unclear if real learning or conceptual change occurs as a result of these interactions (the final position). In fact, in their book, Hew and Cheung (2012) stated that no studies were conducted on how discussions incorporating dynamic media such as audio and video affect students' performance outcome such as knowledge construction. Since 2012, there have been more studies on these new online collaborative tools and their potential use in learning activities though there is still need for more studies demonstrating how these tools can be useful in engaging learners in a collaborative learning experience, especially in the area of online learning, from a pedagogical perspective.

In addition to online learning pedagogy, when taken into account the effectiveness of Flipgrid and VoiceThread as Web tools for online learning, these tools can be useful and improve online education because of their affordances in supporting certain educational activities. In order to decide whether a Web tool can be used effectively in learning online, it is important to understand how these tools can play a role in knowledge building and multiple representations of the educational content (Harasim, 1993, 2012). Using these tools in online interactions can meet the demands of online learners in areas where text-based interactions fall short (Delmas, 2017) such as helping less active students participate more actively in such discussions (Johnson & Skarpol, 2018; Stoszkowski, 2018) as also supported with previous literature (Brunvand & Byrd, 2011; Lerner & Johns, 2009), paying more attention to the quality and reviewing of discussions because of the "human element" that comes with audio and/or visual input (Bartlett, 2018; Johnson & Skarpol, 2018), and the social interest of students towards seeing and listening to others (Hall, 2015; Todd & Mullholland, 2016).

The main advantages of these tools, however, stem from the use of dynamic media, which improves the social presence of online learners. The tools can provide learners with a shared space where they can exchange audio and video interactions. Both Flipgrid and VoiceThread offer online learning environments, also referred to as "lived learning environments" suitable to host a variety of collaborative learning activities. Lived learning environments online resemble a physical learning environment such as cafes, classrooms etc. where students can get together to collaborate and negotiate the meaning through collaboration and conversation (Allen & Otto, 1996; Harasim, 2012). Harasim (2012) asserted that the conversations that take place in online environments are primarily text-based even though multimedia tools such as audio, video, and animation may be incorporated. Using multimedia as the central means of interaction can enhance and enrich communication in areas where written text might fail to do so. Moore (1993), as cited in Borup et al. (2012), suggested that instructors can decrease students' sense of distance by manipulating the communications of media. The appropriate choice of learning tools by instructors and their potential application can make an impact on the learning experience of students.

One of the advantages of audio and video in interactions over text-based communication is that audio and video communication can increase the feelings of social presence further in an online learning environment (Borup et al., 2012). As first defined by Short, Williams, and Christie (1976), *social presence* refers to "the degree of salience (i.e. quality of state of being there) between two communicators using a communication medium" (Lowenthal, 2010, p. 129). In online learning environments, it could be challenging to ensure learners feel the social presence of others as the communication lacks authentic human connection, and social interactions are key to increase the social presence (Palloff & Pratt, 2007). However, additional elements such as watching videos and hearing audio-recordings of other online participants can help students connect to others socially.

Some of the studies addressed in this chapter such as Stoszkowski (2018) and Hall (2015) found that the social element of the audio/video interactions appears to be an important one. In Stoszkowski (2018)'s research, the students were eager to watch others speak instead of reading their posts. In Hall (2015), students showed a high level of interest in listening to their peers. In Delmas (2017), the survey on the use of VoiceThread revealed students felt a sense of overall connectedness to the class and a sense of community was created. In Todd and Mulholland (2016), students particularly liked the audio commenting, which was something new to the students.

Overall, the results of the studies demonstrate that having audio and video components in online interactions contribute positively to create a sense of social presence. As Bartlett (2018)'s study on Flipgrid demonstrated —the findings of which are also supported by previous literature such as Clark, Strudler, and Grove (2015) and Palloff and Pratt (2007)—, feelings of isolation can be reduced greatly through the use of audio and video elements in online asynchronous interactions. Regarding other participants not only as online users but as real people who engage in communicative exchange help learners see online interaction from a different perspective (Bartlett, 2018).

## FUTURE RESEARCH DIRECTIONS

The use of audiovisual interaction tools such as Flipgrid and VoiceThread for asynchronous learning and communication is still a new practice though preliminary studies on the effectiveness of these tools have shown promising results. The current studies examined mainly the student perceptions on these tools in regard to whether they increase the sense of social presence. One other trend in recent research points to the effects of interaction through multimedia on students.

In this chapter, the recent practices have been discussed from the lens of online collaborative learning theory (Harasim, 2012). Practices of using Flipgrid and VoiceThread demonstrate that even though Flipgrid and VoiceThread are promising technology tools and environments, more research is needed to understand how these tools can be used in collaborative learning environments from a pedagogical point of view. Pedagogically, these tools have been used for idea-generating and idea-organizing purposes, but it is not clear if real learning occurs as a result of collaboration through these tools. Though learners experience initial stages of collaboration such as sharing ideas and commenting on others' ideas, it is unclear how these tools play a role in meaningful knowledge construction through collaboration. Future systematic literature reviews on the use of these collaborative tools and other studies investigating the learning outcomes of collaborative activities facilitated by Flipgrid and VoiceThread can shed light on how these tools can improve learning through collaboration.

## CONCLUSION

New collaboration tools such as Flipgrid and VoiceThread are becoming more popular as the conversation on education is shifting towards improving the quality of learning through asynchronous interactions. Traditionally carried out by text, discussions can now incorporate "human" elements with the advances of Web technologies that allow audio and video. The incorporation of audio and video becomes more important in online learning environments as they can enhance a sense of community and presence. An online community enriches students' learning experiences as well as providing students with a safe learning environment where they can share and discuss content, which ultimately leads to meaningful learning (Pacansky-Brock, 2010).

Flipgrid and VoiceThread can also facilitate collaborative activities which usually take place via asynchronous means. In the context of online collaborative learning theory, these tools can support meaningful interaction and create a suitable environment for learning. However, future studies will demonstrate the usefulness of these tools from a pedagogical perspective.

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# Chapter 13
# Higher Education Teaching and Learning With Augmented Reality

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## ABSTRACT

*This chapter is based on a review of the literature, initial lab examinations, and experiences teaching university undergraduate pre-service teachers and master degree students in Instructional Design and Technology. The authors analyzed the literature, benefits, drawbacks, experiences, and educational implications of integrating augmented reality in higher education to prepare students for eventual workplace success. Using augmented reality, three-dimensional interactive digital imaging provides an immersive, engaging learning environment to interact with content in new ways not previously possible. The 3D models can impart significant content information by viewing digital objects from any angle, sometimes peeling back the layers, all in real time. In addition, they consider the educational implications for integrating and evaluating augmented reality.*

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## INTRODUCTION

Augmented Reality (AR) provides the simultaneous interaction between the real authentic environment and a three-dimensional digital overlay of hologram objects in real time. The digital objects can be manipulated by expanding the size of the object, changing the position or location, and viewing it from any angle above, below, or 360 degrees around it.

A study by Yilmaz and Batdi (2016) found augmented reality can be used in a systematic way in order to create fruitful learning environments for increasing academic success. This can be applied to all educational levels. The researchers found augmented reality "has a positive effect on social, cognitive and emotional improvement and it makes the learning environment more realistic" (Yilmaz & Batdi, 2016, p. 273). Augmented reality provides a new type of learning environment. It is one where students with low success rates can learn more efficiently by increasing attention and gaining the ability to materialize abstract concepts for easier comprehension (Cai, Wang, & Chiang, 2014). Augmented reality can be used to create new original 3D digital hologram objects directed towards the desired subject of interest. After creation, the objects can be placed in a real authentic environment to interact with. It "allows us to perceive whole new parts of the world" (Liberati, p. 27, 2016).

The studies mentioned above are more true today as many small public and private universities are dealing with constantly eroding budgets, forcing faculty researchers to look for connections with industry for multiple reasons. One, faculty are more likely to be able to acquire grants both internally and externally if we can find a use for our research in a business or industry setting. Also, in the constant competition to attract the attention of new students to our programs there is a strong underlying demand for the education we provide to connect to the real world as we have to prove to students they can get jobs after obtaining their education from our institutions. Therefore, discussions of industrial connections are included, first:

Augmented reality has roots as far back as 1968 with Ivan Sutherland who developed the first head mounted display (Augment News, 2016). AR technology has continued to grow and evolve in stages ever since. Each new technology development has contributed to the current form we have today. We are really still in the infancy of AR start-ups with both successes and failures. To date, the high-end augmented reality used in universities tends to be Microsoft HoloLens ®™.

Later on, Ronald Azuma is credited with defining augmented reality in 1997 as "AR allows the user to see the real world with virtual objects superimposed or composited with the real world. Therefore, AR supplements reality, rather than completely replacing it" (Azuma, 1997, p. 2). It combines the real world, with the virtual world, appearing as three dimensional objects in real time.

In AR, the 3D objects viewed can be defined and driven by the user. The personalized content selected for viewing can relate to the individuals' area of interest. The objects can be retrieved and examined from pre-made three-dimensional models. Alternatively, objects can be modified from basic shapes provided in some programs, existing code can be modified, or original code can be written to create completely new original 3D objects with some 3D objects offered for free. Highly complex layered 3D objects can take a great deal of time to create, as a result are very expensive to buy. One example is in the medical field where highly granular quality detail is needed, the cost can be extremely high.

When wearing the AR head gear, it has a clear shield to be able to view in the actual environment. After opening the 3D object, it appears as being layered on top of the actual environment. The viewer can walk around the object to look under and over it, and sometimes even look inside of the object depending on how the object was built. The Meta headset has been designed with haptic hand gesture control over the 3D objects. Using Meta one can grab the object using the fist, then drag to move the item to the desired location or resize the object. Augmented reality is truly a new way to see the world through digital enhancement. An excellent goal for augmented reality will be to focus on "delivering a meaningful and compelling experience that enhances your reality" (Papagiannis, 2017, p. 4).

The main limitation with some devices are the need to be tethered to a powerful computer by means of USB and HDMI cables. Shifting to a Wi-Fi set up will allow for more freedom of movement, like one would find when using the Microsoft HoloLens ®™.

Augmented reality has skyrocketing sales "Apple ®™, Facebook ®™, Microsoft ®™, Google ®™, and Intel ®™ are paying close attention to and investing in AR's future to bring it to a mass audience" (Papagiannis, 2017, p. 5). In fact, Google has just announced the release of The Glass Enterprise Edition 2 ®™, business edition augmented reality headset (The Verge, 2019). It has a new processor, improved camera, USB-C port for faster charging, improved processing allowing for computer vision and advanced machine learning capabilities, safety frames, bigger battery, and uses the Android platform (The Verge, 2019).

Major companies are jumping in, like Tesla Motors ®™, Nike ®™, and many others are already creating 3D objects of their products to enhance the user experience. Augmented reality can offer car customers interactive features like selecting different colors, looking inside the car, and looking under the hood to examine areas of interest to them. As one can imagine, the personalization is much more effective than print or web materials limited by traditional design and development methods only showing their own vision.

## BACKGROUND

### Augmented Reality in Education

AR is attractive, especially in higher education since it operates in real time within the context of one's own environment (Greenwood & Wang, 2018). AR in education supports the far transfer of skills, referring to students' ability to use skills from a familiar context to an unfamiliar one (Greenwood & Wang, 2018). We will now examine some of the positive and negative impacts of AR.

### Positive and Negative Learning Impacts of Augmented Reality

The author Radu cites seven areas of positive learning impact and four areas of negative learning impact cited in numerous research studies when using augmented reality (Radu, 2014). Table 1, places the positive and negative features side-by-side for easy comparison. It is followed by detailed descriptions with examples to learn what methods have worked well, while considering future improvements.

### Radu's Positive Learning Impact Defined

1. Increased content understanding was often associated with an increased effectiveness for certain topics when using AR for teaching and learning (Radu, 2014).
2. Learning spatial structure and function domains excelled due to the use of three dimensional objects. Some examples include geometric shapes, chemical structures, mechanical machinery, astronomy,

*Table 1. Comparison of Radu's positive and negative AR learning impact*

| Positive Learning Impact | Negative Learning Impact |
|---|---|
| 1. Increased content understanding | 1. Attention tunneling |
| 2. Learning spatial structure and function | 2. Usability difficulties |
| 3. Learning language associations | 3. Ineffective classroom integration |
| 4. Long-term memory retention | 4. Learner differences |
| 5. Improved physical task performance | |
| 6. Improved collaboration | |
| 7. Increased student motivation | |

Source: (Radu, 2014)

and human organs (Radu, 2014). The learning objects can be built in transparent layers providing the ability to look inside or on top of the objects as overlaying diagrams. The overlaying of diagrams assisted with transferring knowledge to solve authentic work tasks (Quarles, Lampotang, Fichler, Fiswick, & Lok, 2008). AR also provides a concrete way to conceptualize abstract concepts using more detailed mental representations.

3. Learning language or symbolic associations through images increased reading and writing scores when compared to traditional media. (Radu, 2014).
4. When looking at long-term memory retention in the literature, AR learners demonstrated better long-term memory gains when tested one week later (Vincenzi, Valimont, Macchiarella, Opalenik, Gangadharan, Majoros, 2003).
5. When working to improve physical task performance, incorporating AR is more effective than traditional media. Tasks can be performed faster, with greater accuracy, a higher transfer rate, and a lower number of errors (Radu, 2014).
6. Improved collaboration was found when implementing AR. It allowed learners to create shared meanings rather than individualistic efforts. Sharing the display allows students to share the AR experience (Radu, 2014).
7. Improved student motivation was found when using AR in regards to increasing learner satisfaction, the fun, cool, novel factor, and willingness to devote more time to tasks even when it is more challenging. AR tends to increase motivation, creativity, and discovery learning (Radu, 2014).

## Radu's Negative Learning Impact Defined

1. Attention tunneling can cause some learners to overlook important information presented in AR due to the higher levels of sensory input cues competing for attention. A student once described his attention deficit disorder as being like having ten televisions on at the same time and not being sure which one to attend to, resulting in even more effort to learn and perform tasks. Cognitive tunneling and attentional tunneling have been used interchangeably as a problem of allocation of attention responsible for ignoring events outside of the desired area of attention. This can have a negative impact on performance (Wickens, 2005).
2. Usability and perceptual difficulties were encountered due to the use of the head mounted display (Billinghurst, 2002). We agree with Billinghurst's finding since one of our graduate students ex-

perienced this first hand with the weight of the headgear on his neck and back irritating a previous injury. It limited the amount of time he could work with it and the positions he was able to use.

3. Ineffective classroom integration can negatively impact the learning experience. Depending on the setup, AR may not be as readily visible to the instructor when facilitating activities to ensure they remain on task without using projection or access to dual/multiple headsets. On the flip side, if the instructor dominates the experience, it can remove some of the student inquiry and engagement possible. "Finding a balance between teacher-guided and student self-directed learning, and understanding the fit of AR within this process matters deeply" (Garrett, Anthony, & Jackson, 2018, p. 241). This illustrates "a need for effective faculty training and support to successfully integrate these new AR technologies" (Billings, 1995; Nguyen, Zierler, & Ngyuen, 2011). In addition, "carefully planned curriculum integration, incorporating systematic orientation of AR, is most likely to lead to successful outcomes" (Garrett, Anthony, & Jackson, 2018, p. 242).
4. Learner differences show AR is not the best teaching and learning method for everyone. Higher achieving students sometimes did not flourish when the AR experience was too limited in scope as it did not provide sufficient new information to challenge them (Freitas & Campos, 2008).

In addition, if too many technology glitches are encountered, and or a lack of knowledge or experience with AR, it can lead to abandonment (Greenwood & Wang, 2018). This is why support is so critical for long-term success. "Technical problems can quickly become an issue and source of student dissatisfaction with the learning experience" (Garrett, Anthony, & Jackson, p. 240, 2018). Potential drawbacks include the usual technology issues of Internet connections, lag time, crashes, lack of ability to project to a display screen, no live virtual conferencing ability, and the headgear being tethered with wires limiting the possible movement. In this age of worldwide connectedness, it is important to be able to connect and collaborate both in the classroom and on a global scale.

## Technology Considerations

Experiences from our lab work found head mounted displays can be heavy in weight, making it uncomfortable for some people to wear. For individuals with back/neck issues and some other disabilities, usability needs to be taken into consideration. Some head mounted AR displays are tethered with wires making it more difficult to use when limiting the AR mobility. It is easy to be engaged in the AR experience and lose track of the leash limitations.

AR headgears take a lot of computer processing power, speed, graphics, and storage capacity resulting in increased cost. Many require a PC with a high-end graphics card to run the equipment like the Meta ®™ headgear. In addition, the AR head mounted displays such as Microsoft's HoloLens ®™. will set one back about $3,500.00 for the device alone. Another cost associated with AR results from streaming the high-resolution content, rendering at much higher refresh rates, while the bandwidth required for streaming continues to grow. This entails buying higher end capability computers and being hobbled by Internet bandwidth restrictions.

Some areas of frustration for users result from crashes and latency lag times associated with the frame rate of the content drawn, refresh rate of the display, and input lag from the interactions from the start of the new content draw. Users routinely want natural intuitive touch sensation accuracy when grabbing objects and manipulating them. In the future, by adding additional haptic sensors, the tactile AR experience could advance the experience greatly.

In this age of collaboration, it is important to have easy connections to multimodal displays when sharing. This helps in displaying via projectors for synchronous settings and asynchronously for online live virtual conferencing at a distance.

Areas for future improvements to AR include making it easier to import content objects, modifying them, and creating new original 3D objects. Providing more basic template objects could make the process quicker, easier, less time intensive, encourage building on learner success while gaining experience and knowledge to advance even further. Users need to have easy access to documentation on how to download, run the programs, while learning how to create and share effectively and efficiently. In addition, more educational hologram objects need to be available for teaching, training, and learning. An extensive library of three-dimensional learning objects need to be ready to go for immediate use. Educational goals initially need to include providing a rich variety of satisfying and productive AR user experiences with an easy learning curve and ongoing support.

## Technologies Used to Create AR Experiences

In regards to AR, there are two predominant modes of tracking information. The first is image based requiring the recognition of a marker or object to bring up digital information. The second one is location-based using GPS to identify locations where computer-generated information is superimposed (Ibáñez & Delgado-Kloos, 2018). The hardware required for AR includes a processor, display, sensors, and input devices. It can include accelerometers, GPS, camera, microphones and other devices. Computer monitors are normally used to display the AR experience from the point of view of the visitor. However, there are other systems such as optical projection systems, head-mounted displays, eyeglasses, contact lenses, the HUD (heads up display), virtual retinal displays, Eye Tap (a device which changes the rays of light captured from the environment then substitutes with computer generated ones), Spatial Augmented Reality (SAR) which uses ordinary projection techniques as a substitute for a display of any kind and handheld displays. The sensors and input devices include GPS, gyroscopes, accelerometers, compasses, RFID, wireless sensors, touch recognition, speech recognition, eye tracking and peripherals. The majority of the software development for AR is used to take advantage of the hardware capabilities. There is already an Augmented Reality Markup Language (ARML) being used to standardize XML grammar for virtual reality. There are several software development kits (SDK) available also offering simple environments for AR development (Pesce, 2018).

## Augmented Reality Devices

For anyone who has been following AR tech and acquiring AR hardware & software, you might be familiar with the first three companies to develop higher level Augmented Reality (AR) hardware and software. However, their ability to stay in business has not been as successful. This instability has led to;

1. Meta ®™ was a Silicon Valley company known for making augmented reality combining real-world technology with holographic images. Meta included a head-mounted display headset using a sensory array for hand interactions and positional tracking, the visual field view is 90 degrees (diagonal), and resolution display of 2560 x 1440 (20 pixels per degree), considered the largest field of view (FOV). The company was founded by Meron Gribetz, who studied neuroscience and

computer science at Columbia University in New York, under Steven Feiner. Unfortunately, Meta is now out of business thus no longer available to support their equipment.

2. Recon Instruments ®™ was a Canadian technology company producing smart glasses marketed as wearable heads-up displays for sports, though they did not use a transparent display element delivering actual see-through capability of a true heads-up display. Recon offered live activity metrics, GPS maps, and notifications to the user's eye. Recon's first heads-up display offering was released commercially in October 2010, roughly a year and a half before the first Google Glass release. On June 17, 2015, Recon was acquired by Intel, who then closed the Recon Instruments division in the summer of 2017.
3. Vuzix ®™ is an American multinational technology firm headquartered in Rochester, New York, founded in 1997 by Paul Travers. Vuzix provides wearable display technology for both virtual reality and augmented reality. They manufacture and sell the computer display devices and software used for mobile and immersive augmented reality applications, such as 3D gaming, manufacturing training, and military tactical equipment. As a result of an investment from Intel, hardware & software from Vuzix is still available.

Most recently, HoloLens, mixed reality smart glasses, have been introduced to the public. HoloLens has been slowly gaining popularity for being the first Windows Mixed Reality platform under the Windows 10 operating system. The HoloLens is linked to Kinect, an add-on for Microsoft's Xbox ®™ gaming console. Samsung ®™ and Asus ®™ have extended an offer to Microsoft to help produce their own mixed-reality products, in collaboration with Microsoft, based around the concept and hardware for HoloLens.

Our department started our research using Meta's augmented reality and loved many of the features offered such as the greater field of view and more natural navigation movements. Then we tried the Microsoft HoloLens 1, and found many desirable features, as well. Hopefully, over time we will see the best features combined to build on the strengths of each to produce a killer augmented reality experience. HoloLens has a more limited field of view which has been improved in the second release. The navigation seems a little non-intuitive, requiring one to focus on a white dot selection combined with a tap pinch finger gesture which has again been improved in the second version. The HoloLens inclusion of audio listening and audio commands are impressive. HoloLens does not have any cables and does not require a separate computer to run it with the battery charge lasting 2-4 hours. At the time of our experimentation Meta needed to get rid of the cables and the separate computer to run it. HoloLens can already use Skype for live virtual conferencing while Meta did not have a built-in option for live virtual conferencing although we have viewed Meta's demonstration using it. Both have problems trying to project it to an audience to share it. Meta's headgear is more comfortable to wear and holds in place better but could stand to be a lighter in weight to wear it for longer durations.

Meta required a powerful computer to run the augmented reality experience while HoloLens did not as the computing power is self-contained. Meta and HoloLens both need a computer to create the 3D hologram objects. Creating the 3D objects needs to be more user friendly, and include very clear directions with visual step-by-step examples in the correct sequence. There also needs to be easy access to GitHub ®™ or other sources for adding pre-made objects for a reasonable fee. The built-in hologram object design and development needs to be expanded further to show examples for teaching in education at all levels in all subject areas. It is important to provide relevant content related examples when teaching/training people for the current job market using augmented reality like one would find used in industry, military, health care, advertising/marketing, etc. to prepare for future employment. "There remains a need for continued development of the tools shaped with an educational focus" (Garrett, Anthony, & Jackson, 2018, p. 242).

## Mobile Augmented Reality

Mobile augmented reality includes overlaying 3D digital information on a smart device or tablet, while at the same time viewing the real world. Mobile smart devices are equipped with Geo-Positional System (GPS) and use a variety of sensors. Augmented reality is used for accessing and understanding the content presented. By pointing the smart phone or tablet towards the 3D objects, learners can acquire details related to the object.

Some examples of mobile augmented reality are in the areas of gaming entertainment or educational gaming. Often times they are the early adopters due to their high levels of engagement and challenges presented. TripAdvisor has added augmented reality to run on an iPad app. Lonely Planet uses augmented reality elements in several of its travel apps. Twitter allows people to see local tweets superimposed on their camera view of the world around them. The next phase of augmented reality is merging the physical world by triggering dynamic changing content, as one interacts within different fields of study. Some examples include education, training, product design and development, and social collaborative learning. Augmented reality can offer a deeper understanding of the content presented. Often when training preservice teachers one can find applications like Aurasma ®™ used to trigger QR codes or images to access instructional videos, animations, or 3D content. The goal could include collaborating and helping each other to master content relevant to skills appropriate for their curriculum (Greenwood & Wang, 2018).

# MAIN FOCUS OF THE CHAPTER

## Augmented Reality for Teaching

AR has been ranked as an emerging technology by the Horizon Report in 2014 (Johnson, 2014). It has continued to develop quickly and represents an emerging technology for overlaying digital content on top of the real world.

One of the first widespread educational applications of augmented reality was the MagicBook ®™ using a real book and bridging to the virtual using an overlay with models to create an augmented reality scene. Students could fly inside and experience the immersive environment (Billinghurst, Kato, & Poupyrev, 2000). The "educational magical toys during pre-school education increases effectiveness, cooperation and interaction among the students" (Yilmaz, 2016).

The literature cites many examples of using augmented reality in education such as Biology, Anatomy, Astronomy, Chemistry, Mathematics, Geometry, and Physics. Difficult to understand abstract concepts can be illustrated visually in three dimension such as the solar system, molecules, atoms, the human body, and changes over time.

One reason augmented reality is so valuable in education is the ability to materialize and visualize abstract concepts, construct information, develop cognitive thinking skills, experience meaningful authentic hands-on learning, increase affective experiences, increase emerging technology practices, and ultimately increase long lasting student success (Freitas & Campos, 2008; Dunleavy, Dede, & Mitchell, 2009).

In Yilmaz and Batdi's research study (2016) found augmented reality supports integrating the real world with the learning environment to be able to visualize abstract and complicated situations through digital objects. Reaching students at any level contributes to eliminating concept errors, solves learning difficulties while assisting in perceiving complicated situations. Augmented reality also provides positive contributions at the cognitive level by enabling logical learning, creating experiment observations, understanding theoretic knowledge, and activating visual knowledge. In addition, motivation increases interest and curiosity to foster positive attitudes towards learning.

However, if students experienced technical problems, communication issues, eye problems, or a lack of technology knowledge and experience needed, those students could form negative reactions. This points to the need to be prepared, ensure equipment is working, and make sure directions are clear to foster a positive, productive environment for increasing learner success.

When the instructor selects the best instructional strategies for implementing AR it is important to "consider specific characteristics of learners such as age [ability level], duration of the intervention and physical learning environment" (Ibáñez & Delgado-Kloos, 2018). In addition, it would be worthwhile to "consider specific characteristics of learners to select teaching techniques or discriminant factors affecting learning outcomes (Ibáñez & Delgado-Kloos, 2018). This is an inclusive approach to be able to provide access for all students.

## AR Discovery/Exploration/Inquiry/Problem-Based Learning

Discovery learning tends to be problem based where learners discover knowledge during the learning process. Scaffolding can assist learners with keeping on track and staying focused on the learning goals. When applied to augmented reality research it can mean providing assistance to learners by assisting with the generation of guiding research questions, planning, designing the experiment, visualizing the data presented, monitoring progress, and organizing and interpreting the results (Ibáñez, Di-Serio, Villaran-Molina, & Delgado-Kloos, 2015). One research study by Bruce & Bishop (2002) evaluated augmented reality using inquiry-based learning activities applying the five-step design criteria of; 1) ask, 2) investigate, 3) create, 4) share, and 5) reflect. It is through exploration, learners test out their hypothesis, which in turn encourages further study (Santos, Chen, Taketomi, Yamamoto, Miyazaki, & Kato, 2014). Inquiry based-learning provides a student-centered platform for learners to hypothesize, explore, validate, categorize, integrate, evaluate, assimilate, explain, and collaborate to proactively develop deeper high-level learning and self-responsibility. The knowledge gained can then be applied to new situations (Chiang, Yang, Hwang, 2014). This approach falls within the self-directed constructivist learning strategies.

## AR Experiential & Contextual Learning in Authentic Environments

Depending on the augmented reality objects presented they can provide a window to view content normally not visible in three-dimensions. In addition, the objects can be resized and rotated for optimal viewing. When compared to two-dimensional print or electronic media, augmented reality offers a stronger sense of presence and a stronger connection to authentic learning experiences. "Augmented Reality enhances a user's perception of and interaction with the real world" (Azuma, p. 3, 1997). The highly immersive nature of augmented reality is due to its stronger visual impact and interactive ability with 3D visuals. Augmented reality offers "highly interactive digital experiences that fully engage the user's senses" (Radu, p. 1533, 2014). Learning using relevant materials, well integrated, organized, and simulating actual field use improved learning performance (Liu, Lin, Tsai, & Pass, 2012). The real-world perception reduces the cognitive load and provides more meaningful cues for constructing more elaborate knowledge through embodied imaging using both sight and touch. The experiential learning provides a concrete experience to serve as the basis for observation and reflection to formulate new theories to test through new learning experiences. Contextual learning, or learning in context, includes learners relating to new concepts through something familiar, like learn by doing, applying concepts, collaboration, and transferring knowledge to new situations (Santos, Chen, Taketomi, Yamamoto, Miyazaki, & Kato, 2014).

Over time we are seeing an increasing sense of tactile experiences possible through various sensors for object manipulation. AR provides physical interactions by allowing users to move around, over, and above virtual objects within a real environment. Webcam based AR applications like the Nintendo Wii®™ allow users to interact with whole body movements to participate in various sports like bowling and tennis projected onto a flat screen display. It differs from Meta and HoloLens augmented reality where the virtual object content is displayed in the actual physical space at the users' location. It is viewable through a specialized Head Mounted Display (HMD) equipped with a video camera providing the immersive personal perspective.

## AR Learning Immersion, Engagement, & Motivation

Augmented Reality offers a unique participant immersion by providing a bridge between the real-world environment and the three-dimensional interactive objects at the same time. Due to the highly interactive nature of the medium it can be a strong motivator for learners. The immersive environment "allows students to concentrate more and be engaged at a constant level" (Liu et al., 2012). By increasing motivation and confidence it can improve learning outcomes. Through increased engagement and time on task, better cognitive connections are possible. For many, augmented reality provides a new, novel learning experience.

One research study used a modified motivation questionnaire (Chiang et al., 2014) based on Keller's ARCS model (1987 & 2010) including the dimensions of; Attention, Relevance, Confidence, and Satisfaction to evaluate learner engagement using a five point Likert scale. This provides one option for those wanting to measure the AR learning experience based on the different aspects of motivation.

## AR Kinesthetic Learning

AR provides multimodal experiences using visual, aural, and tactile senses (Greenwood & Wang, 2018). The tactile physical interactions can provide kinesthetic learning opportunities through physical movements (Greenwood & Wang, 2018). This could be a great way to gain practice through performance-based physical skills.

## AR Social Learning

Two premises for social learning related to AR are the More Knowledgeable Other (MKO) and the Zone of Proximal Development (ZPD) built on immersive, interactive learning through group interactions. The MKO refers to the person providing insights to support learners by providing the information needed. ZPD refers to the distance between the ability to perform a task with collaborative support for solving a problem independently (Greenwood & Wang, 2018).

In AR the level of social presence is often perceived as how social, warm, sensitive, personal, or intimate the experiences are when interacting with others. This can include individual or group goals or some of both depending on the tasks at hand.

## AR Cognitive Learning

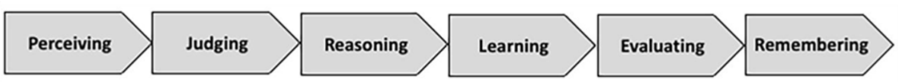
According to a "The Peak Performance Center" article on Cognition and Learning (2019), cognitive learning is a multi-step process of perceiving, thinking, reasoning, remembering, judging, and understanding. Cognition is the mental processes to acquire, process, and understand new information through the senses, thoughts, and experiences in order to create knowledge. Cognition involves absorbing information, processing it, and applying it to new situations. It can be a conscious or unconscious process. Learning then happens at the end of a series of cognitive processes, but not all result in learning. Through experiences, processing, and learning, new knowledge can be generated through a variety of mental activities. The cognitive processes allow one to create new ideas, concepts, and knowledge. Learning is just one part of the cognitive process created through the learning experiences. Based on an understanding of cognitive processes, it is easy to see how AR experiences provide opportunities for increasing learning as shown in figure 1.

Learners must be engaged in the learning tasks to maximize learning opportunities. The focus needs to be on learning rather than the excitement of working with cool new emerging technologies. For learners, new to understanding three-dimensional visualizations, additional support may be needed. To ensure overall project success, thought needs to be given to how the research will be set up, how to provide learners with clear step-by-step tutorials, training, practice, and ongoing support. The scaffolding can assist all learners and especially those with low self-regulation ability. When these items are well in place with clear learning goals and objectives it can have a huge impact on the academic learning outcomes. Effective learning strategies are the most critical factor for improving academic achievement.

More guidance is needed on the methods used to structure the appropriate levels of cognitive load for engagement with AR content in learning (Nadolny, 2017). "The results showed that the instructional design, number of digital interactions and pedagogical strategies influenced user interactions within the activity. In particular, a page designed with immersion, instant feedback, a focused task and high level cognitive tasks engaged users to interact with the digital content" (Nadolny, 2017).

When using AR for learning, the cognitive goal includes increasing attention, memory, and retention of the content. Through appropriate instructional strategies the limited working memory can be improved by decreasing the cognitive load through reduced complexity to focus attention on the learning tasks and increase memory resources needed to accomplish learning goals. The instructional design principle used is based on the coherence principal where materials not related to the task should be excluded to reduce extraneous processing (Mayer, 2010). When learners are immersed in an appropriate challenge

*Figure 1. Cognitive Learning Processes*
*Source: (The Peak Performance Center, 2019)*



with clear goals and immediate feedback the cognitive task can move beyond rote memorization into the higher-level problem solving (Nadolny, 2017). Through the coordination of perception, cognition and interaction, objects can be turned into tools for learning (Zap & Code, 2016).

The cognitive load theory developed by John Sweller (1994) identifies three different types. One, intrinsic load which refers to the mental effort students put forth in learning the topic. Second, extraneous load, deals with the way the tasks are presented to learners and the mental load required to process it. Third, germane load indicates the work students put into creating a permanent storage of knowledge to recall for use or performance. As you can see the cognitive load is multi-faceted requiring learner engagement, well-designed instructional materials, and student effort to learn and perform.

In a later research study, a cognitive load survey was created with a total of four questions; two questions on mental load and two questions on mental effort using a Likert scale created by Sweller, Van Merrienboer and Pass (1998) to evaluate cognition.

Other researchers have evaluated cognitive outcomes based on Bloom's Taxonomy of educational objectives (1956) with low level cognition identified as remember and understand and high-level cognition such as create, apply, analyze, and evaluate. These methods of evaluation provide some options for evaluating the cognitive level of students' performances when conducting AR research. Often times, evaluations are conducted with a pre-test and post-test, using multiple-choice or short answer.

In the future, it might be "useful to include measures of the acquired capacities to build hypotheses, to contrast them, and to build new knowledge from interactions with the augmented environment and in pairs" (Ibáñez & Delgado-Kloos, 2018). Both quantitative and qualitative measures can help to better understand cognitive gains when using AR for learning. Triangulating the data collected will also help to validate the findings.

## Augmented Reality for Learning in Multiple Discipline Areas

Augmented reality is invading our visual world in many ubiquitous ways, subtly, and well blended with reality when done correctly. Augmented reality is being used in many different fields of study, all requiring teaching/training to preparing learners for employment opportunities. Virtual reality has been huge and it is anticipated augmented reality will grow even larger. It is most likely due to the benefits of 3D imaging and the ability to see the objects in motion, and from any angle, while viewing the real world at the same time, such as a heart beating or lungs breathing for a more comprehensive understanding. This makes a great environment for teaching/training about the objects, all within a safe environment. In addition, augmented reality allows for the overlaying of maps and diagrams on top of real objects so directions and tools can be made explicit. Some current field examples are illustrated in the following paragraphs.

Rather than using a human cadaver for every class on human anatomy, instructors can instead introduce a reusable digital cadaver into the classroom. Using appropriate augmented reality, the cadaver can safely demonstrate new techniques and processes, repeatedly all without the legal, financial, human restrictions of using a real cadaver.

The military uses augmented reality in all manner of training and operations, to control functions in planes, tanks, and ships. For instance- in modern fighter aircraft, the pilot can look down or behind, to see if any aircraft are present or closing in. The plane becomes all but transparent with all the cameras feeding the pilot's demand for knowledge and data, overlaying their real world, as needed, to help keep them alive and to support their mission. In addition, for many years, military aircraft and helicopters have used Heads-Up Displays (HUDs) and Helmet-Mounted Sights (HMS) to superimpose images upon the pilot's view of the real world. Besides providing basic navigation and flight information, these graphics are sometimes registered with targets in the environment, providing a way to aim the aircraft's weapons. For example, the chin turret in a helicopter gunship can be slaved to the pilot's HMS, so the pilot can aim and fire the chin-controlled turret simply by looking at the target.

The construction sciences are rapidly changing with the introduction of augmented reality bordering on virtual reality. Whole buildings (cathedrals, bridges, ancient ruins for example) can be examined with LIDAR- a laser based radar- basic photographic images, x-ray and ultra-sonic examination of the data, then stitched via computer software to give an almost complete 3D means of studying everything about the structure. New buildings can be totally modeled before they are built without digging a hole or pouring any concrete. Instead of taking time to painstakingly build a model out of plastic, wood, or other materials, a complete structure can be created with the added advantage of being able to then run various analyses on the capability of the building to withstand various applied stresses. Thus, identifying weak links long before they can cause injuries or fatalities.

Tourist sites around the world can be accessed via augmented reality to display what tourists might see if they were to visit. This can either help the tourist to decide to spend their money going there, to avoid spending money, or satisfy their desire to explore sights now off-limits to tourists as a result of the harm they are doing by their presence in an, otherwise, pristine environment. When visiting, the active tourist can overlay their visual augmentation devices on various features to obtain more information and learn more about each special feature. Another example would be the overlaying of GPS maps on the windshield of an automobile for routing when traveling.

Sports on TV are now being overlaid with all sorts of graphics to inform the viewer about the capabilities of players, their actions on the field, the distance to be traveled for the next first down, and much more data. The coaches are then using the data to determine whether their players are competitive on the field of play, to determine what adjustments are needed to perfect their play, maximizing the results while minimizing the efforts.

Has anyone seen any of the dance companies now dangling by wires on the sides of a building or just dancing on the stage, in darkness, only to be illuminated and supplemented by computer generated images on and around them? The dancers no longer perform in just 2 dimensions, but now perform in virtual 3D spaces.

Closer to home, retail fashion stores are resorting to bringing "Magic Mirrors" into their stores where the customer can stand, be scanned, then try on an assortment of garments without the time and effort of actually physically doing that. Then in real time, all but the actual fit of the garment can be viewed in the mirror, expediting the selection of clothes. Another example is, IKEA ®™ retail furniture allowing for viewing of their products in one's home.

Advertising & Marketing is providing new experiences for customers. For example, Tesla Motors ®™ has a 3D model of their car where one can view the outside of the car and put their head through the window to view the dashboard and interior of the car. A great way to be able to see the exact model of the car one wants and see it in the desired color. Nike ®™ has created augmented reality models of their shoes for unique user experiences to inspire sales.

## Economic Impact of Augmented Reality

In a Freakonomics radio presentation (Nov. 24, 2018), a couple, Zach and Kelly Weinersmith, were interviewed about various technologies with the potential to boost productivity in industry. One such technology is Augmented Reality. Their thoughts about Augmented Reality and its potential effects from an economic perspective, noted that all types of training can be augmented, thus training times can be drastically reduced. For example, there are, "companies who are integrating augmented reality into construction helmets. And the task that the people did was done with fewer errors, the very first time" (Kelly Weinersmith, 2018). "You actually learn how to do it faster. So, the economic benefit of that could be huge, especially right now when some people argue there's a skills mismatch. So, if you can fix that skills mismatch without having to have people go to two years of training, if you can cut it down to a year or six months, that's potentially really huge" (Zach Weinersmith, 2018). "So in general, it could make our workforce more efficient, more likely to catch errors before they happen, and it could make training happen much more quickly" (Kelly Weinersmith, 2018).

Referring back to the educational impacts noted earlier, the potential exists to accelerate the On-the-Job-Training (OJT) progressing to the point where a novice could follow the instructions. This could apply to sales, construction, emergency treatment and many other fields. All this while the activities are monitored with immediate and continuous feedback.

# RECOMMENDATIONS

What has contributed to AR's increasing success? Three key elements have "enabled the mass adoption of AR apps: 1) meaningful content, 2) convincing and realistic interaction of the virtual with the physical environment, and 3) unique value that goes beyond what other technologies deliver" (Javornik, 2016, p. 1). For AR to continue to flourish and grow, it will be important to improve task efficiency and improve the quality of the user experience. To leverage all that AR has to offer, we need to pay attention to the educational needs, goals, and objectives to determine how the activities are conceived, planned, designed, tested, revised, and implemented to create effective learning experiences. It will be important to capitalize on the unique features AR has to offer through immersive 3D hologram objects overlaid over the real-world backdrop to inspire deeper learning for all. We need to consider the best instructional practices of cognitive content acquisition, and alignment to the tasks and instructional goals of discovery, exploration, inquiry, problem-based, kinesthetic, and social learning activities to engage and motivate learners. Learners need quality tutorials, scaffolding, practice, and clear goals/objectives to be successful. A careful examination of the needs, goals, objectives, pedagogy, and unique characteristics of the learners need to be identified to properly align AR with the learning tasks. In this manner, AR can prove its value for learning. With clear goals driven by purpose and utility we can help learners to see the relevance and value of AR in their learning process (Moule, Ward, & Lockyer, 2010). Augmented reality needs to continue to improve in quality so the user experience is seamless and easy to use without hindering learning interactions. We need quality evaluation tools to measure users' experiences with the goal of benefiting learning.

## FUTURE RESEARCH DIRECTIONS

In the following paragraph, you will learn what the author, Tarun Mittal (2018) views as the future of augmented reality. "Today, the world's biggest tech companies like Google ®™, Apple ®™, and Facebook ®™ are heavily invested in expanding the application and adoption of AR. Apple recently announced an update to ARKit ®™ – a platform allowing developers to create AR apps for the iOS ecosystem – that will increase AR functionality in iPhones ®™ and iPads ®™. Google, having had a rocky entry into AR with their Google Glass 1, is experimenting with bringing AR to the web platform. Their goal is to bring AR content to any user with an AR-enabled device and browser. Microsoft, too, entered the market by building upon their Kinect technology by launching its mixed-reality HoloLens 2. This is just the start. Analysts predict the AR/VR market, which was worth $11.4 billion last year, will grow to $215 billion by 2021. AR alone is projected to accrue 1 billion users by 2020. Due to more diverse applications not requiring dedicated hardware, AR is expected to dwarf the VR in market size in the coming years. With so much research and development going into the field of AR, the coming years promise to be the most exciting era for what is one of the most revolutionary technologies today" (Mittal, 2018, p. 5-6). It will be important to continue studying the effects of integrating augmented reality in both teaching and training to continually improve learning outcomes.

## CONCLUSION

"Together, augmented reality and virtual reality have grown tremendously in investments this year totaling $1.1 billion" (Isberto, 2018, p. 2). People want their digital experiences to be seamlessly woven into their lives and activities and augmented reality extends this opportunity. Reviewing the literature on the use of augmented reality demonstrates how with the appropriate topic capitalizing on the best use of the 3D holographic objects, learners are able to generate high level knowledge, are inspired to spend more time on tasks, improve learning when well-designed and appropriately aligned with the content, and improve metacognitive perceptions. "The use of a visual aid has been shown to be an effective teaching method, and studies show an increase in memory retention" and "AR technology can work independently, generating better academic results" (Ferrer-Torregrosa, Jimenez-Rodriguez, Torralba-Estelles, Garzon-Farinos, Perez-Bermejo, & Femandez-Ehrling 2016, p. 7).

There are still technology challenges needing improvements to take augmented reality even further for a seamless intuitive experience. More 3D educational hologram objects need to be created and shared for free or a reasonable price to extend its use and application using audio and vision-haptic interactions.

For AR to be fully implemented into the curriculum, the infrastructure, support and training must be in place (Greenwood & Wang, 2018). Educators will need to be taught how to use the technology, and how to implement it purposefully into their curriculum (Greenwood & Wang, 2018). Additionally, "students need to be trained in the use of augmented reality technology before using it in learning activities" (Ibáñez & Delgado-Kloos, 2018). This is a good way to ensure focus on the learning tasks and not on how to use the technology. In looking towards the future, it will require organizational, financial, administrative support and user buy-in for AR to continue to flourish (Greenwood & Wang, 2018).

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## KEY TERMS AND DEFINITIONS

**Augmented Reality (AR):** The augmented reality technology provides the simultaneous interaction between the real authentic environment and a three-dimensional digital overlay of objects in real time.

**Extended Reality (XR):** It is a term referring to both augmented and virtual reality. The X represents the computer-assisted visual modification to reality.

**Field of View (FoV):** The Field of View is the visual area where users can see virtual content in an augmented reality headset. It is also known as "FoV," a measurement of the angle formed by the distance from the user to a fixed point in space and the bounds of vision to the left and right of that point.

**GL Transmission Format (gITF):** It is a free format for exporting 3D models and scenes from one program and importing them into an application to view in augmented or virtual reality.

**Head Mounted Displays (HMD):** Augmented reality is a method of digital projection happening inside a Head Mounted Display (HMD), generally in the form of goggles, glasses, or a specialized visor.

**Heads Up Display (HUD):** The Heads-Up Display (HUD) is a technology allowing a computer-produced diagram object to be superimposed and stabilized on a specific position on a real-world object.

**Hologram:** An augmented reality 3D hologram object is placed into the real learning environment. It is formed using light projection on a transparent display to interact with it.

**Inertial Measurement Unit (IMU):** It is a self-contained system measuring linear and angular motion usually with a variety of gyroscopes and accelerometers.

**Light Field:** It enables objects to be displayed at varying focal planes, allowing for the illusion of depth in an augmented reality experience.

**Mesh:** A web of identified points in space and lines drawn between them representing a computer's raw view of the three-dimensional space. This is commonly seen in the HoloLens when an application is mapping its environment, or when viewing layers of a 3D model.

**Optical Engine:** This refers to a component in a head-mounted device generating visual content for the user. An optical engine includes the device's GPU, light-generating, and mirroring elements, all connected to a CPU and interface for input, and a transparent display for output.

**Platform:** The platform is a major software environment where smaller applications run.

**Simultaneous Localization and Mapping (SLAM):** A system originating from robotics and computer vision, SLAM is the procedure by which a computer scans an environment and constructs a digital map of the area. This has become a standard for anchoring augmented reality content within the real world physical spaces. This is the process ARKit apps undertake to detect surfaces.

**Six Degrees of Freedom (6DoF) Tracking:** In AR and VR, 6DoF describes the range of motion a head-mounted display allowing users to move on an axis in relation to virtual content in a scene. The three degrees refer to the motion of the user's head—left and right (yaw), backwards and forwards (pitch), and circular (roll)—Applying these concepts to augmented reality three pertain to the movement within the space—left and right, backwards and forwards, and up and down.

**Software Development Kit (SDK):** An SDK consists of a group of development tools used to build an application for a specific platform.

**Toolkit:** A set of software tools enabling specific functions on a platform. For example, ARKit is a toolkit enabling AR functions for apps running on the iOS platform.

**Tracking:** In augmented reality, tracking is the method by which a computer anchors content to a fixed point in space, allowing users to walk and/or look around it, as defined by the degrees of freedom allowed by the display device. In marker-based tracking, computers recognize a two-dimensional image or code on which it anchors the content. In marker-less tracking, the computer uses some other mapping techniques (usually SLAM) to determine a surface to anchor content.

**Virtual Reality (VR):** The computer-generated simulation of a three-dimensional environment with simulated objects. The virtual reality replaces the user's view of the physical environment with a virtual environment interacted with by a person using an electronic helmet with a screen inside or gloves fitted with haptic sensors and includes audio.

**Visual-Inertial Odometry (VIO):** Pairs a camera and inertia sensors in a device to estimate its position and orientation.

**Waveguide Displays:** They are transparent displays through which digital content is projected for users to see in their field of view.

# Chapter 14
# Language Learner Engagement in Telecollaboration Environments

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## ABSTRACT

*This chapter explores student engagement during telecollaboration processes as well as fundamental aspects to foster its development. In order to tackle this aim, a theoretical discussion about student engagement in technology-mediated learning processes, and particularly, telecollaboration environments is presented together with a practical case study exploring this construct. Three different types of student´s engagement (emotional, cognitive, and behavioral) are considered in a telecollaboration project between a Spanish and a North American university in which 32 students participated over four months. In addition, with regard to the analysis of students' engagement in telecollaboration projects aiming for language development, different approaches and theories are presented in order to shed light on the analysis of this construct during online virtual exchanges. Aspects such as student use of technology, engagement scales, and surveys and an analysis of the interaction are considered. Finally, further research lines regarding telecollaboration and engagement are suggested.*

## INTRODUCTION

In the 21st century, the use of technological devices as well as instructional technology have become one of the main opportunities to increase and foster college student engagement. The need for teachers to keep pace with the latest technological changes in society has led to the incorporation of tools and technological processes within the classroom environment. In this sense, different ways of fostering students' engagement inside and outside the classroom environment have been put into practice in order to analyse to what extent technological processes can contribute to this development. One of these processes is telecollaboration which refers to virtual intercultural interaction and exchange projects

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between classes which are geographically distant from each other (O'Dowd, 2013; Dooly, 2008). In this sense, telecollaboration becomes a virtual learning environment (VLE) where students interact and participate in group work from different places making use of the available communication tools (Dooly, 2017). Specifically, this type of virtual exchange has been widely investigated by researchers in the second language learning field due to the possibilities that online platforms offer for interaction from stationary and in some cases ubiquitous devices. Research exploring the use of telecollaboration for language development has often made use of eTandem to maximize students' time during the virtual exchange. This type of telecollaboration involves students exchanging the role of the native speakers so that they can benefit from the interaction in the target language (Belz & Thorne, 2006; O'Dowd, 2013). The growing number of articles in this field has been pointed out by experts who stated that one of the main reasons for this growth was the increase of accessible technology in classroom environments (Dooly and O'Dowd, 2012). Similarly, together with the growing amount of research exploring telecollaboration environments, different platforms and software have arisen as a consequence of technological development, simplifying the accessibility to telecollaboration processes. For instance, the creation of the Web Real-Time Communication protocol (WebRTC protocol), which uses P2P communication, allows students to connect through the web browser without having to download any specific software to carry out the virtual exchange. Simply by sharing a link, students can access a private virtual room where the interaction takes place, accelerating the connection between peers and avoiding the use of a server to monitor the process and thus delaying the information exchange (Author, 2019). Platforms such as Skype or Adobe connect, which were used in previous telecollaboration research (e.g. Tian & Wang, 2010; Barron & Black, 2015; Jauregi, 2011), are no longer necessary due to the aforementioned technological improvements which highly increase students' access to online interaction.

Taking into consideration these new possibilities for telecollaborative processes, it becomes necessary to understand and foster students' engagement during this type of virtual exchange. Telecollaboration studies have normally focused on aspects such as intercultural competence, language development, students' perceptions or the analysis of interaction among others (Cunningham & Akiyama, 2018). However, the number of studies addressing students' engagement in the telecollaboration field is still very scarce. Thus, this chapter attempts to explore the engagement construct during telecollaboration processes and to shed light on how to appropriately measure it, as there is no clear research methodology in the existing literature. In order to tackle this aim, a case study analysing students' engagement in a telecollaboration project is presented. Moreover, different approaches to measure students' engagement are taken into consideration and discuss from a theoretical perspective.

## ENGAGEMENT AND TECHNOLOGY-MEDIATED INSTRUCTION

Fredricks, Blumenfeld and Paris (2004) defined engagement as a meta-construct that involves different types such as emotional, behavioral and cognitive engagement, and thus, these different factors should be taken into consideration by researchers exploring this aspect in learning environments. According to the aforementioned authors, behavioral engagement refers to those behaviors which are related with students' academic success such as high attendance levels, active participation during the classes and homework completion. This contribution ascribes to the previous definition of behavioral engagement. However, other researchers such as Finn, Pannozzo, and Voelkl (1995) or Finn & Rock (1997) relate this type of engagement with positive conduct and the absence of any kind of behavior that could be disruptive during the learning process. This type of engagement is considered to be crucial to achieve proper academic outcomes and avoid drop outs (Fredricks & McColskey, 2012). With regard to emotional engagement, students' feelings during the learning process and factors such as interest, apathy, boredom or frustration are taken into consideration (Henrie et al., 2015). Other authors such as Fredrick & McColskey (2012) considered emotional engagement as being the positive or negative student reaction to teachers, classmates or school among others. Finally, cognitive engagement considers students' efforts to understand teachers' explanations such as being thoughtful or willing to make an effort in order to understand and put into practice complex ideas or skills (Henrie et al., 2015; Fredricks and McColskey, 2014).

Normally, learning engagement has a positive effect on other factors such as students' satisfaction and learning effectiveness (Benbunan-Fich & Hiltz, 2003). Analysing these factors becomes fundamental to better understand students' engagement in technology mediated processes, and thus, apart from the use of scales considering the different types of engagement, students' perceptions on learning and satisfaction need to be considered. In other words, experimental case studies analyzing learning effectiveness or satisfaction may explain how a particular medium improves students' engagement in the learning process (Hu & Wui, 2012). In this vein, the results of studies conducted by Blass and Davis (2003) or Liaw, Huang and Chen (2007) examined the relationship between engagement and effectiveness in learning reported that high levels of engagement contribute to improving learning outcomes. However, it becomes necessary to further understand how technology modifies students' engagement during the learning process. Technology-mediated learning often implies a higher degree of involvement of students who become responsible for many learning tasks as well as the time and pace in which learning takes place. This situation, may in some cases, become problematic, particularly with those students who struggle to feel motivated with the module or class. Moreover, as the class shifts from a teacher-centered approach to a student-centered one, those individuals without an appropriate knowledge of computer skills may become disengaged with the learning process (Allen & Seaman, 2007). Nevertheless, for those computer literate students, the shift towards mediated-technology instruction becomes an advantageous situation as their autonomy is highly increased. In this sense, another fundamental aspect to understand students' engagement in technology-mediated learning is students' relationship with the technology implemented in the classroom environment. Students' degree of engagement may vary depending on the technological device or platform used during the learning process, and normally if students are familiar with its use, engagement levels tend to be higher than with those platforms or devices they are using for the first time (Henrie et al., 2015). This clearly emphasizes that students' prior knowledge about using a particular tool may affect their engagement, and consequently, the learning process. Thus, it becomes fundamental to analyze students' use of technology in advance to better implement technology-mediated instruction and foster the learning process. Likewise, as for telecollaboration environments, students' previous experiences as well as their use of technology and videconferencing tools may affect their engagement levels.

## MEASURING ENGAGEMENT IN TELECOLLABORATION ENVIRONMENTS

Different scales have analysed engagement during learning processes, many of them, incorporating Fredricks et al.´s (2004) distinction with regard to the types of engagement. In this sense, Fredrick and McColskey's (2012) investigation collected and analysed 11 scales measuring students' engagement which are presented in Table 1.

*Table 1. Scales measuring students' engagement*

| Scales |
|---|
| *Attitudes Toward Mathematics Survey (ATM)* (Miller, Greene, Montalvo, Ravindran, Nichols, 1996) |
| *Engagement vs. Disaffection with Learning – Student Report (EvsD)* (Skinner, Kindermann, & Furrer, 2009). |
| *High School Survey of Student Engagement (HSSSE)* |
| *Identification with school questionnaire (ISQ)* (Voelkl, 1996) |
| *Motivated strategies for learning questionnaire (MSLQ)* (Pintrich DeGroot, 1990) |
| *Motivation and engagement scale* (MES) |
| *Research assessment package for schools* (RAPS) |
| *School engagement measure (SEM)* (Fredricks, Blumenfeld, Friedel & Paris, 2005) |
| *School engagement scale/questionnaire* (SEQ) |
| *School success profile* (SSP) |
| *Student engagement instrument* (Appleton et al., 2006) |

After an in-depth analysis of the abovementioned scales, the authors of this investigation determined that researchers should use different methods of assessment when analysing students' engagement, emphasizing that the use of qualitative and quantitative methods could contribute to a better understanding of this factor. Apart from the use of the scales and questionnaires, qualitative methods including in-depth descriptions of the context as well as observational methods could allow teachers to further understand variations in students' engagement, whether positive or negative. This becomes fundamental to explore the dynamic and interactive nature of a construct that is often analysed exclusively through scales without tracking fluctuations during the learning process (Fredrick and McColskey, 2012). Taking these concerns into consideration, students' engagement in technology-mediated instruction should be analysed from different angles. With regard to the available scales that adequately incorporate Fredricks et al.´s (2004) types of engagement and, specifically apply them to technology-mediated learning, it is worth mentioning Henrie et al.´s scale (2015). As opposed to the previous scales to measure students' engagement, this scale was particularly designed for technology-mediated instruction, allowing researchers to accurately measure the potential engagement of a particular technological device or process. However, this instrument by itself cannot analyse the whole construct and thus, other factors such students' use of technology, satisfaction, perceptions of learning and observational methods need to be incorporated into the analysis.

Other studies exploring engagement in telecollaboration research (e.g. Oskoz, Gimeno-Sanz & Sevilla-Pavón, 2018; Vinagre & Corral-Esteban, 2018) have made use of the appraisal theory to analyse students' engagement. This model developed by Martin and White (2005) consists of an analysis of students' linguistic patterns in order to evaluate aspects such as attitude, engagement or appraisal aims to show how people position themselves in relation to their discourse (Vinagre & Corral-Esteban, 2018). Martin and White (2005, p. 35) differentiate between three interacting domains within the language used by students: attitude, including in this category instances where learners express emotions or judge peoples' behavior; engagement, normally presented as argumentation strategies typically found in online discussion (Coffin & Hewings, 2004); and graduation, in which students can adjust their degree of appraisal strengthening or weakening their value judgements. Especially interesting for this chapter is the concept of engagement within this framework, which refers to "those resources by which text references, invoke and negotiate with the various alternative social positions put at risk by a text's meanings" (White, 1998, p. 13). In this sense, during online discussions, engagement is not taken into consideration exclusively depending on the speaker position but also on speaker's reactions to different opinions and ideas during the conversation. Martin and White (2005) further divide this type of engagement into: "monoglossic" statements or assertions in which facts are presented without recognizing any other alternatives; and "heteroglossic" statements which allow different opinions during the interaction. With regard to monoglossic statements, propositions are presented either as facts or something that is taken for granted, or as a statement that could give rise to a subsequent discussion. As for heteroglossic ones, the aforementioned authors proposed two different categories: "dialogically expansive", those in which the utterance can allow different positions and voices; and "dialogically contractive," those in which the utterance "acts to challenge, fend off or restrict the scope of such dialogic contraction" (p. 102).

Thus, Martin and White's (2005) becomes a totally different approach in comparison with Fredricks et al.´s (2004) understanding of engagement. In this model, the engagement is measured through the language used in the interaction allowing researchers to analyse students' linguistic patterns throughout the virtual exchange. This is definitely an approach to be considered when analysing students' engagement in telecollaboration processes, however this model is unable to measure fluctuations in the engagement construct as well as explain why students present higher or lower levels of engagement. In other words, this type of analysis is going to be an adequate tool to measure the quality of the task design that, as previously mentioned, has been found to be one of the main factors in fostering students' engagement during telecollaboration processes. Nevertheless, it does not consider the technology implemented or the environment in which the interaction takes place. Thus, instruments such as a questionnaire measuring students' use of the technological device used by the teacher, for instance Dugas (2005) Technology Catergory Adopter Index (TACI), a log tracking the fluctuations of the engagement construct, or end-of-course surveys analysing students' satisfaction and perceptions on the learning process become fundamental for a detailed analysis. These two models are complimentary and further research into engagement in technology-mediated instruction should contemplate the use of the two types of analysis to offer a wider picture of students' engagement in online virtual exchanges.

## TELECOLLABORATION

Telecollaboration has been used for different purposes such as the development of students' intercultural competence (e.g. Belz, 2003; Schenker, 2012; Ferreira-Lopes, Bezanilla & Elexpuru, 2018), second language interaction (e.g. Ware & Kessler, 2016; Author, 2019) or collaborative learning among others (e.g. Redmond & Lock, 2006; Lamy & Goodfellow, 2010).This type of virtual exchange has been widely investigated in the educational field and, in particular, more in the language learning field. However, during the last years this type of online communication is extending into other fields, as shown by Guth, Helm and O'Dowd (2012) in their investigation about telecollaboration in university classes. Despite this increase, the language learning field is still the most dominant area in telecollaboration processes due to the possibilities of non-native speakers to maintain a synchronous online conversation with a native speaker in a different location. This process is normally referred to as teletandem (Pérez-Hernandez, 2014) has been widely investigated emphasizing different aspects of language development. For instance, Levak & Son (2016) explored students' listening comprehension during an online virtual exchange. Two different platforms, skype and second life were used to observe the effectiveness of the online interaction in both platforms. Research instruments involved the use of a pre and post-test as well as interviews to further understand students' perceptions in both environments. Findings indicated positive results in terms of listening skills development as a consequence of the interaction in both platforms.

As for oral skills, studies such as Romaña-Correa's (2015) or Yen, Hou & Chang's (2015) investigated students' speaking skills in different telecollaboration environments. In the first case, 12 A1 English as a foreign language (EFL) learners carried out online conference calls through Skype to put their target language into practice orally. An evaluation of the interaction yielded positive results in terms of speaking development and the platform was found to be a fertile ground for fostering speaking development. Similarly, Yen et al., (2015) analysed speaking skills development of 42 participants on an EFL course in which they made use of Skype and Facebook. Synchronous interaction through Skype and asynchronous one through Facebook were analysed through the use of correlation, performance and qualitative content analysis. As in Romaña-Correa's (2015), findings indicated participants´ improved speaking competence at the end of the study. Further significant studies in the telecollaboration field such as Jauregui, de Graaf, van den Bergh & Kriz's (2012), explored aspects such as motivation during virtual interaction. In this case, different questionnaires, collected at different times of the online exchange were studied in order to further understand motivation levels at different stages of the process. Results yielded a positive effect particularly in those students with a low linguistic competence.

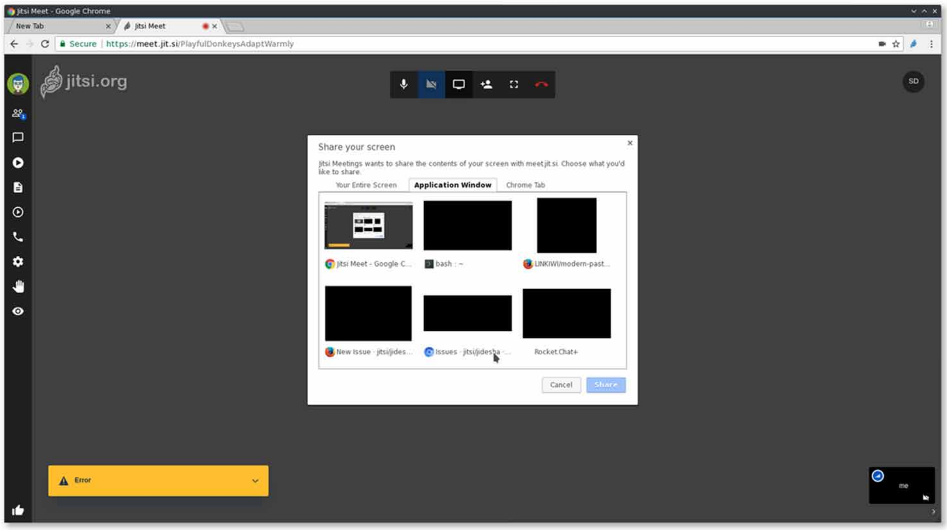
With regard to telecollaboration and engagement, many studies have emphasized the importance of developing this construct during telecollaboration processes in order to maximize the virtual interaction. In this sense significant research in the field such Terhune's (2016), Mullen, Appel & Shanklin's (2009) or Helm & Guth's (2016) have highlighted the importance of an appropriate task design, many times encouraging students to collaborate in the creation of content or the achievement of certain task goals to foster students' engagement. Similarly, in order to maintain students' engagement and achieve the sustainability of the project over time, teachers need to collaborate equally during the telecollaboration process as well as foster students' participation (Helm & Guth, 2016). Other aspects such as students' expectations, time zones, cultural differences as well as different types of assessment for each of the participants may affect students' engagement. Thus, it is teachers' responsibility to control the aforementioned aspects to better implement telecollaboration processes and foster students' engagement. Nevertheless, although there is an extensive body of literature analysing aspects that could help foster engagement during telecollaboration processes, there is a lack of case studies evaluating students' engagement during the online communication exchange. Thus, in order to further understand how mediated technology instruction, and specifically telecollaboration affects students' engagement, the following section presents the analysis and results of a telecollaboration project carried out at a Spanish university in which this construct was evaluated.

## ENGAGEMENT AND TELECOLLABORATION: A CASE STUDY

This investigation involved 30 university participants between 18 and 27 years of age from a Spanish and a North American University. Participants at the Spanish university attended a B1 English as foreign language (EFL) course where they received three teaching contact hours per week over four months. On the other hand, students at the American university attended a course about history and culture of Spain and received two teaching contact hours per week. In addition to the in-class time, students in the two universities participated in a virtual online exchange in which a minimum of two interactions per week were required. Both teachers made use of the WebRTC protocol through the web application Jitsi (Figure 1) in order to provide students with a platform for the online exchange. This web application uses the web browser and an open Peer to peer (P2P) protocol to allow web real-time communication (WebRTC). Thus, students could create their own private room which could only be accessed through a personal link. This link was later shared with their fellow students in order to initiate the interaction. Furthermore, other functionalities within the platform such as the possibility of adding multiple participants, screen-sharing, text chat, and video and audio-sharing were at students' disposal throughout the project. As opposed to other platforms such as Adobe connect which requires a premium membership, or Skype in which some of the aforementioned features are premium, this platform is an open educational resource (OER) accessible for free.

Students participated in dyads following the eTandem model in which they exchange the role of the native speaker in order to improve their language skills. Students' personal information was collected and both teachers received permission from their universities as well as from participants to exchange students' contact details in order to initiate the interaction. With regard to the task design, both teachers based the project on social constructivism (Vygotsky, 1978) in which aspects such as the co-construction of knowledge as well participants' reflection on the language exchange are of great relevance to the learning process. Similarly, the social context in which learning takes place as well as the cultural similarities and differences between the two groups are taken into consideration within this approach. Task design

*Figure 1. Jitsi interface*



took into consideration Chapelle (2003) and Ellis' (2002) criteria about the elaboration of interaction tasks. Aspects such as authenticity, learners' needs, practicality or meaningfulness were considered by the two teachers when designing the task. Likewise, other factors such as goals, input given to participants or procedures carried out during the interaction were also considered in advance. Topics during the interaction were taken from the English coursebook that was used throughout the module so that students were familiar with the vocabulary during the online synchronous exchange. Both teachers elaborated a set of questions that were subsequently used by students during the exchange. These questions were not mandatory and students were recommended to follow the natural flow of the conversation. Topics such as leisure time, food, sports, or environmental issues were included in this list of topics. The interaction also included an information gap activity in which participants had to get information about their respective countries, thus students had to prepare these topics in advance in order to answer their peers. The information obtained was subsequently reported in class so that all the students benefited from the different interactions of their peers. A minimum time of ten minutes per interaction was set in advance, however students were free to continue the conversation. No restrictions regarding dates or time to start the interaction were set, participants made use of their email to arrange a time and day that could fit the two students participating in the interaction. Practical considerations involved the exchange of information between classes; guaranteeing all the participants had a computer or laptop with internet connection and a built-in microphone and webcam; and a 1-hour lesson in each of the classes to explain the project as well as the platform used for the online synchronous exchange.

## Methodology and Results

A mixed methods approach (Creswell & Clark, 2017) was used, combining the anlaysis of qualitative and quantitative information. Fredricks et al.'s (2004) categorization of engagement was taken into consideration in order to analyse students' engagement throughout the telecollaboration project. The data collection instruments and measures analysing the engagement construct are presented in Table 2.

First, a survey exploring students' use of technology based on Dugas' (2005) survey was given to participants before the start of the project. This survey may explain students' engagement in relation with the technology used as a high degree of familiarity or use may guarantee high levels of engagement. Hence, it was necessary to understand students' use and previous experience with telecollaboration tools in order to counteract their effect on students' engagement. Results indicated that all the participants in the experiment were familiar with the use of ICT tools and a 40 per cent of the students highlighted that their knowledge on ICT was "high" or "very high." Nevertheless, regarding their participation in

*Table 2. Measures and instruments implemented to measure students' engagement*

| Instrument | Measure | Item |
|---|---|---|
| Technology adapter category index (TACI) | Use of technology | 1-10 |
| Longitudinal engagement scale | Emotional engagement | 1-4 |
| | Cognitive engagement | 5-7 |
| | Behavioral engagement and learners' characteristics | 8-30 |
| | Previous experiences | 31-32 |
| Log | Analysis of the interaction | No items |

previous telecollaboration projects, 90 per cent of the participants indicated that it was the first time they were involved in a virtual online exchange. These findings highlighted that although all the students were "digital natives" (Prensky, 2003), they had no previous experience with telecollaboration projects. In this sense, it can be confirmed that students' engagement was not due to their previous experience with this type of projects. During the experiment a log was used to track fluctuations of the construct, students had to register the start and end time during the exchanges so that the teachers could monitor the time spent with each of the participants. Figure 2 presents the results of the average time employed by participants during the exchange.

As it can be observed in Figure 2, regardless of the minimum time students had to spend chatting with their peers, students spent between 15 minutes and 80 minutes per interaction. The average amount of time was 41.9 minutes which indicated that students did not limit themselves to the 10-minute requirement. However, regarding the start time of the interactions, the time zone became a problem that had to be addressed by the teachers in the project. A five-hour difference between the Central European Summer Time and Eastern Time led to misunderstandings that caused disappointment in some participants. This had to be explained in order to guarantee students' presence during the interaction with their peers.

At the end of the course, a scale analysing students' engagement and a survey exploring students' satisfaction and perceptions on learning were completed by participants. As for the scale, Henrie et al.'s (2015) longitudinal measurement of engagement in technology-mediated instruction was used. The scale incorporated the three types of engagement that were explained at the beginning of this chapter: emotional, behavioral, and cognitive. To visualize the results of the scale, items belonging to emotional, behavioral and cognitive engagement have been grouped separately and are presented below. In addition, statistical analysis of the frequencies as well as inferential statistics (Wilcoxon test) and effect size were carried out to evaluate the results obtained in the scale.

Emotional engagement was explored in items 1-4 and findings highlighted a high degree of acceptance with regard to students' enjoyment and interest (Z =5.18, $p < 0.01$ and Z= 5.44, $p < 0.01$ respectively) with a very strong effect size in the two cases (r = .91 and r =.96 respectively). Students'

*Figure 2. Average time per student during the telecollaboration project*

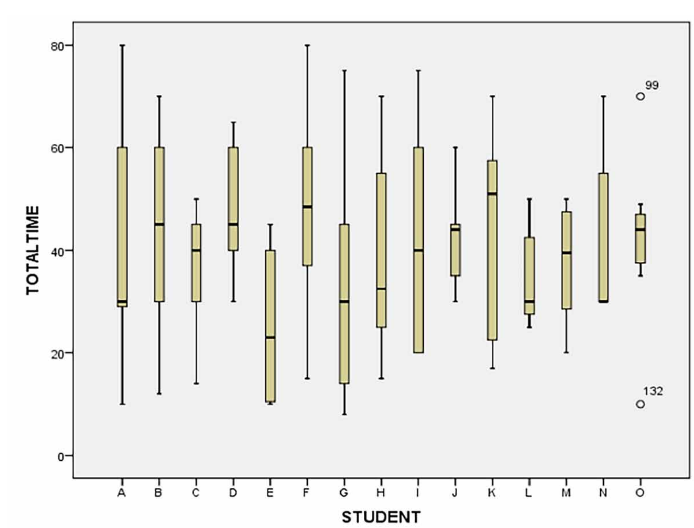


*Table 3. Cognitive engagement in the telecollaboration project (%)*

| | Max | Medium | Neutral | Medium | Min | |
|---|---|---|---|---|---|---|
| **Active** | 0 | 94 | 6 | 0 | 0 | **Passive** |
| **Focused** | 91 | 9 | 0 | 0 | 0 | **Distracted** |

degree of excitement also presented high frequencies with the 84 per cent of students indicating "Very excited" and 16 per cent marking "Excited". As for cognitive engagement, Table 3 present the results collected in the scale.

The responses given by students indicated that they were particularly active before the start of the interaction as they were going to meet their peers for the first time. As they had to use and understand the target language during the exchange, students' levels of cognitive engagement during the exchange were high. Items addressing students' degree of concentration confirmed these findings ($Z = 5.25$, $p < 0.01$, $r = .92$), most of the students noting high levels of concentration to understand their peers.

The transactional model of students' engagement (Eccles & Wang, 2012; Henrie, Larsen, Manwaring, Halverson & Graham, 2016; Lawson & Lawson, 2013) which takes into consideration the environment where learning occurs as well as learners' characteristics was also considered in the scale. Figures 3 and 4 present students' positive and negative attitude towards the course.

As presented in Figures 3 and 4, students presented a positive but very neutral attitude towards the course and the module. These results highlighted that engagement could not be directly justified as a consequence of students' attitude towards the module as no significant scores were found for each of the parameters. The scale also measured other aspects of participants such as the importance of the subject matter as presented in Figure 5.

*Figure 3. Students' positive attitude towards the course and module*

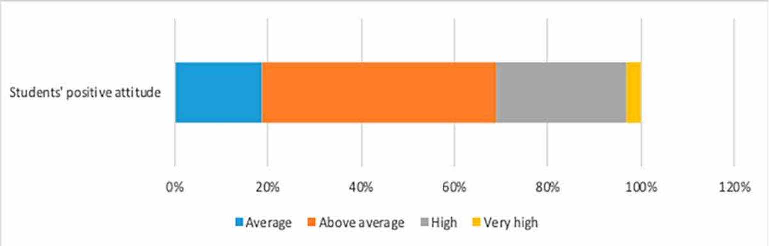



*Figure 4. Students' negative attitude towards the course and module*

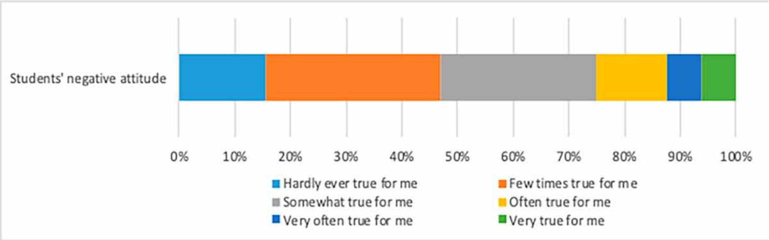
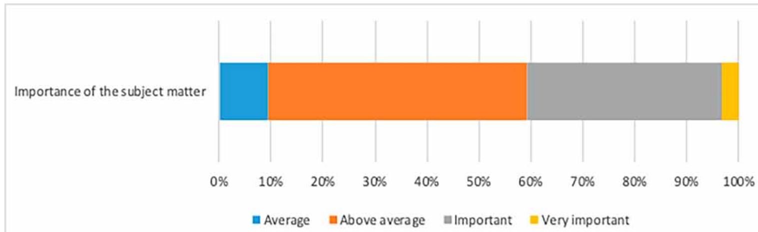


*Figure 5. Importance of the subject matter (English Language)*




Most of students indicated "above average" when asked about the importance of the subject matter, which could contribute to the engagement of the participants throughout the project. Furthermore, items exploring participants' apathy and eagerness to learn were also considered in order to further explore the engagement construct. The results of these items are presented in Table 4.

Students' indicated that, on average, they were more eager to learn that felt apathetic. However, these percentages were not significant as a majority of students expressed feeling apathetic or eager to learn about half of the times.

Finally, students' satisfaction and perceptions on the telecollaboration project carried out were collected in an end-of-course survey. This survey was based on Jauregi and Bañados' (2008) investigation into an online video-web project. Close-ended items in the scale addressing students' opinions and perceptions were analysed through inferential statistics, using the one-sample Wilcoxon ranked test and the results are presented in Table 5.

*Table 4. Students' degree of apathy and eagerness to learn (%)*

| | Students' apathy | Student's eagerness to learn |
|---|---|---|
| Never or only rarely true for me | 0 | 3 |
| Sometimes true for me | 16 | 34 |
| True for me about half the time | 59 | 53 |
| Often true for me | 16 | 9 |
| Always or almost always true for me | 0 | 0 |

*Table 5. Perceptions about the telecollaboration project (Scale 1-5)*

| Item | N | Mean | SD |
|---|---|---|---|
| Value of the videoweb project in which you have participated | 30 | 4.37* | .76 |
| Use of the videoconferencing tool | 30 | 3.70 | .95 |
| Functioning of the virtual environment | 30 | 4.1* | .80 |
| Usefulness of the interaction | 30 | 4.5* | .57 |
| Ease to communicate with a foreigner | 30 | 3.57 | .72 |
| Interest in communicating with a foreign student | 30 | 4.43* | .62 |

*Statistical significance $p < 0.01$

Different factors such as the value of the telecollaboration project ($Z = 4.85$, $p < 0.01$, $r = .88$), the value of the interaction ($Z = 4.92$, $p < 0.01$, $r = .89$) ($Z = 4.92$, $p < 0.01$, $r = .89$), the functioning of the virtual environment ($Z = 4.70$, $p < 0.01$, $r = .85$), or students' interest ($Z = 4.90$, $p < 0.01$, $r = .89$) were found to be statistically significant. Open-ended items were also used to gathered students' opinions about the project. Participants highlighted the possibility of speaking with another peer anytime and anywhere as well as being able to know each other's cultures and habits. Furthermore, students remarked the fact that they were able to use their target language skills out of the classroom environment which help them foster their speaking abilities.

These findings aligned with those in similar telecollaboration projects such as Gimeno's (2018) investigation, which analysed students' expectations and perceptions of a telecollaboration project carried out between a Spanish and mid-sized American University. Findings in the two cases indicated that students were very positive toward collaborating with their peers as well as discussing different intercultural issues. Furthermore, students who at the beginning of the project were reluctant to participate in the interaction remarked a high degree of satisfaction by the end of the project. Nevertheless, students also indicated negative aspects such as the difficulty to arrange a time for the interaction with their peers due to the time zone difference or the quality of the internet connection which was also found to be problematic in previous telecollaboration projects (e.g. Levak & Son, 2017; Nicolaou & Sevilla-Pavón, 2017).

## DISCUSSION AND CONCLUSION

Overall, participants were found to be highly engaged during the telecollaboration project, particularly in terms of cognitive and emotional engagement. Furthermore, the tracking of the times for each of the interactions indicated that participants engaged with the virtual exchange. Likewise, students' perceptions and degree of satisfaction with the telecollaboration project were positive in line with previous studies in the field (Lee, 2018; Lewis, O'Rourke & Dooly, 2016). However, there is still room for improvement with regard to the task designs used in this type of online synchronous telecollaboration projects as well as with the communication tools implemented. These factors together with an adequate analysis of students' engagement will help foster students' target language abilities and contribute to reaching higher levels of engagement. In this sense, teachers and practitioners may need to consider technological and content analysis approaches to further understand students' engagement during telecollaboration processes. Moreover, the use of qualitative methods including in-depth descriptions and observational methods could allow teachers and practitioners to further understand variations in the engagement construct throughout telecollaboration processes in order to maintain high levels of engagement.

Telecollaboration environments offer the possibility of getting groups of students together, in many cases, with similar learning aims. From a second language perspective, those students learning English as foreign language in a non-English speaking country frequently struggle to find opportunities to put their target language skills into practice out of the classroom environment. Their contact with the target language is only limited to in-class time and during a limited amount of time which makes it difficult for second language learners to develop their listening and speaking abilities. Furthermore, methodologies such as communicative language teaching (CLT) are not fully widespread among language teachers which makes it even more difficult for foreign language learners to receive appropriate and authentic input in the target language. In this sense, with the rapid development of online communication tools, teachers have the possibility of developing telecollaboration projects with a certain degree of ease.

These virtual exchanges allow students to practice their language skills with native speakers as well as to develop learners' intercultural competence. In addition, a project which takes into consideration the task design, the communication tools, and the exchange of information between the teachers, does not represent an increase of the teacher's workload. Students' autonomy is emphasized as they are responsible for organizing the language exchange with their peers and the role of the teacher is simply monitoring the process. In the past this process had to be carried at specific places and times of the day, however nowadays laptops and mobile phones are able to handle telecommunication processes anytime and anywhere. Although internet connectivity is still an issue, the information and communication technology figures (ITU, 2018) estimated that about 3.9 billion people will be using the internet by the end 2018. The growth in developed and developing countries is steady, and thus language teachers should make use of all the possible resources in their hands to foster learning processes.

As for telecollaboration and engagement, further research is required to better understand how to foster and maintain students' engagement during telecollaboration projects. The literature in this field is still very scarce and different approaches to students' engagement have been implemented in several case studies (e.g., Author, 2019; Oskoz, Gimeno-Sanz & Sevilla-Pavón, 2018; Vinagre & Corral-Esteban, 2018). Thus, different research lines should be tackled. These including, how to foster students' engagement during telecollaboration projects emphasizing aspects such as: 1) task design including collaborative learning aims to foster interaction and group work between peers; 2) open online communication tools that do not require a lot of time to master and that students could use with certain ease; 3) the cooperation of teachers belonging to different institutions. Second, an adequate analysis of students' engagement, taking into consideration the technology implemented as well as learners' characteristics may contribute to a better understanding of students' engagement during telecollaboration processes. In this sense, from a methodological point of view, Fredricks et al.'s (2004) construct of engagement, differentiating among emotional, cognitive and behavioral engagement needs to be considered. Data collection instruments should include: 1) a survey analysing students' use of technology; 2) a log in order to track fluctuations in the engagement construct; 3) a scale addressing the different types of engagement in technology-mediated learning; 4) surveys using close and open-ended items in order to understand students' satisfaction and perceptions on learning. Likewise, the use of the appraisal theory may allow researchers to delve into the language used during the virtual exchange as well as into the quality of the task design which becomes a fundamental factor to foster students' engagement. Thus, both approaches to analysing students' engagement are complimentary and may help researchers understand how the technology implemented as well as the language exchange affect students' engagement during telecollaboration processes.

Overall, research into analysing and fostering students' engagement in telecollaboration environments is still very scarce and further research is sought. Case studies as the abovementioned still present a limited number of participants which may affect the validity and generalization of the results obtained. Thus, the use of replication studies in different contexts making use of the same telecollaboration tools and task designs may help researchers understand variations within the engagement construct as well as contribute to generating learning guidelines that could be used cross-culturally in different telecollaboration projects.

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## KEY TERMS AND DEFINITIONS

**Autonomy:** Freedom to learn any kind of content without the need for a teacher or traditional tuition methods.

**CALL:** Discipline that investigates the use and application of technological tools and automatic processes to develop language learning.

**E-Learning:** Learning process that normally takes places through the internet or through the use of electronic resources.

**E-Tandem:** Online exchange in which students swap the role of the native speaker to benefit from each other's mother tongue.

**Engagement:** Students' emotions, attitudes or behaviors while they are involved in a certain task.

**Telecollaboration:** Refers to virtual intercultural interaction between classes geographically distant from each other.

**Virtual Exchange:** Online process that uses technology to foster exchanges of all kinds and interaction among participants.

# Chapter 15
# Cultivating Student Engagement in a Personalized Online Learning Environment

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## ABSTRACT

*Higher education has a national imperative to change the ways it supports its increasingly non-traditional populations who seek completion of college degrees in more flexible online environments. However, online education can present challenges to such students learning remotely and often independently, and who may struggle with accessing, understanding, and processing course content and achieving mastery of outcomes. A unique model based on technology and data-driven decision-making that is undergirded by two teaching and learning frameworks—adaptive learning and universal design for learning—is presented, along with outcomes and best practices. By adopting revolutionary methods of engaging students online and ensuring mastery of course and program learning outcomes, which enhance persistence and degree completion, such a model addresses this national educational imperative.*

## INTRODUCTION

Technological advances have unlocked opportunities in all sectors of society, perhaps most notably by facilitating education via online learning environments. Simply expanding access to a college education, however, does not ensure that enrollment translates to degree conferral. The shift to increasing access must also include more sophisticated technological tools based on pedagogical practices that boost engagement and student agency to enhance teaching and learning in virtual environments.

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In this changing landscape, there is a growing divide between those who are able to reap the benefits of successfully completing college and those who are falling further behind. The widening gap in degree attainment for adults 25 and older, racial and ethnic minorities, first-generation college-goers, and low-income students also deepens the earnings gap (Emmons, Hernandez, Kent & Ricketts, 2018). Even more concerning, the effects can echo for generations: Children from low-income families have only a 10% chance of graduating with a 4-year college degree by age 24 (Cahalan, Perna, Yamashita, Ruiz & Franklin, 2016). The value of a 4-year degree for underserved women is especially clear; median earnings of adult women with a bachelor's degree are 50% higher than those with a high school degree or less (U.S. Census, 2017). While the incentive to pursue a degree is compelling, the barriers to accessing and completing college can seem insurmountable.

This chapter describes how a small all-women's private higher education institution uses two teaching and learning frameworks embedded in educational technology to support the success of its adult women undergraduates. The objectives of the chapter are to provide evidence from research and literature to support the use of these two frameworks and to describe their implementation so that readers can visualize ways to apply practices in other institutional contexts. The first framework is adaptive learning technology for promoting personalized student engagement and enhancing opportunity for targeted faculty interaction with learners. The second framework is Universal Design for Learning (UDL), whose principles, when embedded in course designs, illustrate an inherent way to foster online students' engagement in their own learning. Finally, best practices for implementation of these two frameworks are discussed.

## BACKGROUND

As the 21st century dawned, Bay Path University (BPU) was serving an increasing number of adult women undergraduates who were older than 18-24, working full-time, raising children (many single-handedly), or caring for parents, and who were determined not to remain among the 77 million American women without a bachelor's degree (U.S. Census, 2017). Since these students needed to be able to complete coursework and interact with classmates and professors on their schedules, in 1999 BPU developed an accelerated academic schedule that disrupted the traditional semester calendar by implementing a weekend college. The 6-week accelerated face-to-face classes offered in this model met students' needs for a time.

More recent technological innovations have allowed BPU to consider the delivery of adult women's education in ways that profoundly shape the teaching and learning experience. In 2013, the university responded to needs for flexibility with an online program called Social Online Universal Learning (SOUL), a model built on evidenced-based practices that is at the heart of The American Women's College (TAWC) of Bay Path University. SOUL's optimum virtual learning environment capitalizes on technology to facilitate interaction with instructors, advisors, peers and mentors; clear examples and rubrics that provide step-by-step explanations; prompt and frequent feedback on performance that includes strengths and ways to improve; validation of women's abilities and prior experience; and straightforward pathways to graduation. To achieve the elements of optimal and personalized teaching and learning in this model, TAWC employs a learning management system (LMS) populated through a centralized course development model, with consistent business rules that govern the functioning of courses, including expectations for feedback on assignments, faculty and student interaction, and faculty professional development. These attributes, when working in concert with data on course and faculty performance, ensure instructional consistency and quality necessary to engage effectively TAWC's 1,250 students, who take 90% of their credits online.

SOUL's ecosystem of supports is comprised of six major aspects, each of which contains a varying number of initiatives, structured workflows, and opportunities to collect evidence of student achievement. As depicted in Figure 1 below, the first aspect of SOUL is its accelerated 6-week course schedule, which facilitates students' immersion and momentum, enhancing course completion. The second aspect of SOUL is the intentional and thoughtful on-boarding processes for new students (SOUL Connect), including mandatory orientation sessions conducted virtually, assessment of college readiness habits and dispositions, and the opportunity and to connect with a dedicated educator coach, a professional non-faculty academic advisor. The third of SOUL's elements is the intentional on-boarding and professional development (SOUL for educators), also conducted virtually, for course instructors. The fourth of SOUL's elements is its wraparound supports, a wide variety of interventions and proactive outreach by educator coaches and career coaches, powered by data on student activity running in predictive analytic models. The fifth element of SOUL is peer-to-peer social and academic engagement (SOUL Communities). In many ways, this is a virtual replication of the powerful sisterhood that developed organically among students in BPU's weekend college. Finally, the sixth aspect of SOUL is its incorporation of adaptive learning courseware, which can be thought of more generally as personalized learning. Adaptive courseware called Knowledge Path (KP), currently developed and embedded in 25% of TAWC courses, allows instructors (and students) to follow granular-level learning maps, provide instruction and personalized learning opportunities, and supply on-the-fly remediation when needed. Adaptive courses, which work in concert with the Universal Design for Learning (UDL) guidelines built into curriculum in the LMS, allow instructors to use "high-tech high-touch" practices to personalize learning to students, promoting persistence and degree completion. These two teaching and learning frameworks, embedded in the SOUL model of virtual student engagement, are the focus of this chapter.

## FRAMEWORKS THAT MEET THE CHALLENGES OF ONLINE ADULT LEARNING

### Adaptive Learning to Support Personalized Learning

Not long after the development of computers, adaptive learning technology was applied to instruction and education, with the goal of rendering teaching and learning more accessible and scalable. Suppes (1971) and Atkinson built an instructional system in the 1960s to deliver standardized drill-and-practice and tutorial activities. Educators and computer scientists took a step forward in the 1970s with systems such as SCHOLAR and BIP that paired domain-specific knowledge and skill schemas with data gleaned from assessment questions to tailor learning experiences to student needs (Carbonell, 1970; Barr, Beard, & Atkinson, 1976). As with earlier systems, content was uniform for all learners but now a layer of artificial intelligence diagnosed misconceptions that caused students to answer questions incorrectly.

Adaptive learning systems (ALS) further expanded computer-based instruction by adding, removing, and alternating content based upon student needs and allowing students to choose their own paths through the curriculum (Brusilovsky & Peylo, 2003). In this model, the ALS presents questions to students and uses a machine learning algorithm to react to data generated by the answers students provide. The way data are used depends upon the design and intent of the ALS. A basic response could be to provide

*Figure 1. SOUL educational model*


ancillary material or suggest an alternative form of the learning content to struggling students. More advanced systems will find patterns in an individual learner's interactions and will adjust the learning experience—content provided, questions asked, learning pathway, etc.—according to the resulting profile (Pugliese, 2016). The underlying commonality is that an ALS personalizes the learning experience to provide just-in-time support to learners.

Though still in early stages of development and research, ALSs show promise to help faculty to overcome Bloom's two-sigma dilemma (1984), the two standard deviation performance gap between students engaged in traditional classroom settings and students engaged in one-on-one instruction, by providing the benefits of one-on-one instruction at larger scales. Less instructional time is necessary since the ALS provides the lowest levels of remediation in an automated fashion as students respond to questions. Faculty are able to respond to analytics provided within the ALS to focus intervention strategies as necessary and appropriate to the class's and individual students' needs. A subsequent meta-analysis by VanLehn (2011) reinforced these benefits by finding that certain forms of technology-mediated tutoring attained equivalent outcomes as human tutoring.

## Universal Design for Learning to Support Brain Functioning

The concepts of prior learning, affective states, and metacognition have long been incorporated into pedagogical theories on a student's ability to take in experiences and stimuli from the environment and convert it into knowledge (Bandura, 1977, 1993; Dewey, 1938; Duckworth & Gross, 2014; Dweck, 1986, 2000; Kolb & Kolb, 2017). Research confirms that learning differences and resultant self-defeatist attitudes present challenges to motivational and learning processes for adults (Bandura, 1993; Dweck, 1986; Knowles, 1984). More updated understandings of the brain indicate that there is wide variation in brain functioning across individuals and even within individuals within differing contexts (CAST, 2018). For adults studying online, lack of connectedness and agency over their own learning often lead to disengagement from the learning process. The framework of UDL is the second pedagogical approach that TAWC employs in its course design to personalize learning, honor students' prior experiences, optimize learner agency, and enhance affective states and metacognition.

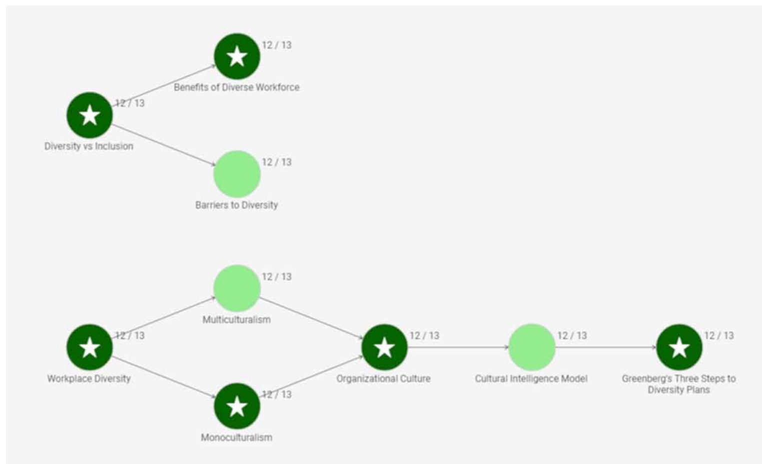
Meyer, Rose, and Gordon (2014) developed the UDL framework in 1984 as a guide for their work with children with learning disabilities, catalyzed by their frustration with various learning initiatives' lack of success at the same time that they were recognizing the power of technology to adapt curriculum beyond the prevailing method—printed text. Grounded in research in education, psychology, neuroscience, and learning analytics, UDL seeks to prevent the blows to self-efficacy engendered in learners who learn differently. The UDL framework capitalizes on fairly recent and powerful gains in understandings of the brain and how humans learn by promoting pedagogy that capitalizes on the three parts of the brain that control their respective networks of brain wiring: recognition networks, the brain's receptors of sensory information; affective networks, where information is processed for meaning; and strategic networks, which regulate action (CAST, 2018).

# HOW THE SOUL MODEL UTILIZES THESE FRAMEWORKS FOR STUDENT ENGAGEMENT

## The SOUL Model: Adaptive Learning Framework

TAWC has adopted adaptive learning as a technology-mediated strategy for increasing student engagement in nearly 25% of its hybrid and online courses. The majority of these courses are focused in high-enrollment areas—the core curriculum, business, and psychology programs—to sustain broad impacts. Of particular importance has been the redesign of math and English courses to include adaptive components since all students must complete these requirements before graduating. Each course follows a similar design wherein adaptive assignments serve as vehicles for content and skill acquisition. Comprising each adaptive assignment is a series of activities that are mapped into pre-, post-, and co-requisite relationships (Figure 2). An activity has content that imparts the skill or knowledge, and a set of questions, typically objective in nature, to evaluate students' mastery. Students engage their learning at higher cognitive levels in asynchronous formative activities—such as discussions, labs, peer reviews—and summative assignments in the LMS. All elements of adaptive courses are aligned to the desired outcomes of the module, course, and program (Wiggins & McTighe, 2011).

*Figure 2. Learning map comprised of nine activities with students' mastery levels indicated*




## Personalization

A core theoretical underpinning of ALSs, and specifically TAWC's adaptive implementation, is the role that personalization plays in student engagement and success in the learning process. Cronbach (1975) and Glaser (1984) theorized that personal characteristics such as aptitude, personality, prior learning, and preferences combine with instructional conditions and lead to learning. Subsequent research on ALSs in instructor-led courses has demonstrated that personalization results in positive student engagement and academic outcomes. The personalization of ALSs has been found to be related to students' perceptions of improved learning and enjoyment of increased control over the learning process, though evidence of improved mastery has been mixed (Akbulut & Cardak, 2012). Some studies have provided additional evidence of a positive relationship between educational outcomes and individualized pacing, teacher support, and instructional content in adaptive courses (Lin, Guot, & Lin, 2016; Yang, Gamble, Hung, & Lin, 2014). Personalization within an ALS therefore is a promising component to improve student engagement and learning.

Academic program directors and instructional designers at TAWC have drawn from research to include several types of personalization in adaptive courses. To address differences in prior learning and cognitive level, the ALS presents a pre-assessment in each adaptive assignment. Students who have familiarity with or stronger ability to reason through concepts of the assignment are able to proceed to later activities in the learning map. Many activities also provide alternative versions of content for the same skill or element of knowledge. The most common configurations for alternatives are (a) a textual-graphical representation paired with a hypermedia representation and (b) a textual-graphical or hypermedia version with a worked example. Students select their preferred version of the content and the ALS learns over time the students' preferences and the types of content from which they have learned best. Pacing and the pathway to complete an assignment also vary over the period of time devoted to each adaptive assignment. The mechanisms for achieving these personalized elements are the branching and parallel nature of learning maps (Figure 2). Students choose their direction and determine the time they spend progressing through the maps. Finally, TAWC faculty members learn in an initial training course to use the ALS's analytics to differentiate instructional support to students based on areas of identified strength and weakness.

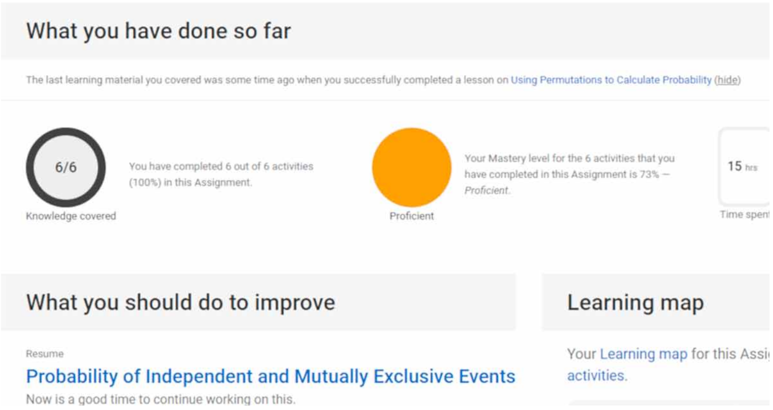
Personalization has resulted in positive outcomes for TAWC students and contributed to student perceptions that adaptive technology is a benefit to their learning, as gauged by a student survey of the ALS and end of course evaluations in the 2017-2018 academic year. One theme is that students prefer courses that include the ALS because it offers multiple representations for many activities in adaptive assignments. A representative comment was, "I like the additional ways of learning, such as reading and the videos. I am the type of student that needs a variation of how the material is provided." Students also had positive perceptions about personalized pacing. In the ALS survey, 86% of respondents felt that the pacing of adaptive assignments was "just right" (other choices were "somewhat slow," "somewhat fast," and "too fast"). Similarly, open-ended comments showed an appreciation for individualized pacing—"I learned at a pace that worked for me," for example—and for start and stop learning at times that were convenient to the student.

## Metacognition

Engaging students in the practice of metacognition has many positive effects in the educational process. There are two domains to metacognitive thinking: reflection and self-regulation. Anchoring reflective processes are questions about (a) what students think they do and do not know and (b) how they think (Flavell, 1979). Self-regulation of thinking, meanwhile, is comprised of students planning their approach to learning, monitoring their progress, and checking their outcomes (Brown, Bransford, Ferrara, & Campione, 1983). Metacognitive strategies have been linked, with large effect sizes, to achievement of academic goals, deeper learning, and increased transfer of learning to novel scenarios (Hattie & Donoghue, 2016). Elements of reflection and self-regulation similarly benefit students' motivation and affect (National Academies of Sciences, Engineering, and Medicine, 2018). ALSs incorporate several mechanisms to support students' metacognition, such as interface cues about planning and mastery, student control of learning, and regular formative assessment (Bull & Kay, 2013). Tools such as these provide students with information upon which to draw reflections and to regulate progress through ALS maps.

RealizeIt, the ALS platform on which TAWC delivers adaptive courses, incorporates many features to encourage learners' metacognition. Foremost, the system presents objective questions throughout an assignment. Pre-assessment questions provide students the opportunity to take stock of their existing strengths and weaknesses and plan accordingly for their studies during the week. Quiz-like questions embedded within and at the end of activities culminate in a graphical representation of a student's mastery level for each activity in the form of a shaded node on the assignment's learning map (Figure 2). The ALS additionally provides guidance to the student to consider where to focus re-learning or practice efforts. A sample dashboard (Figure 3) demonstrates, for example, that the student would benefit from remediating activities where mastery is below proficient (i.e., marked red), resuming an abandoned activity, or practicing the overall assignment (i.e., attempting the questions again). These data points similarly provide detailed language for the learner to use when engaging one-on-one with an instructor or tutor. The dashboard and learning map enable the student and instructor to identify exactly which activities and questions are challenging and to bring attention to those areas for improvement.

*Figure 3. ALS dashboard showing student progress, mastery levels, and suggested learning steps*




Students have responded favorably to the opportunity to monitor and reflect upon their learning process. Common perceptions shared by students responding to the ALS course survey were that the system provided actionable information that helped learners stay on track towards outcomes (73% of respondents) and therefore helped them achieve better outcomes than if they had not had the system's support (80% of respondents). Responses to the survey's open-ended items shed additional light on specific features that students found helpful in their metacognitive process. One theme that emerged was an appreciation of how pre-assessment in the ALS was a benefit over traditional textbook-based courses. The prevailing sense was that this feature established "existing knowledge and skills" such that "it helped me realize what I needed to learn." Mastery cues throughout the learning process were also seen as beneficial in supporting metacognition. Shading on the learning map helped students reflect on when to "quickly go back and reread the section" and to monitor when to "weed out the things that you know [so you] only learn the things that you aren't familiar with or don't remember." Frequent knowledge checks embedded in adaptive assignments is an element of the ALS that was also shared across TAWC students' comments as aiding in the development of metacognitive practices.

## Self-Efficacy

Bandura (1977) initially defined the concept of self-efficacy as a learner's self-perception of her ability to perform the set of behaviors that are necessary to achieve a desired outcome. Feelings of self-efficacy positively impact students' engagement in a variety of ways. First, self-efficacy relates to the affective domain of motivation, yielding benefits of elevated persistence, fewer negative responses to challenges, increased selection of difficult tasks, and higher levels of effort (Zimmerman, 2000). Second, self-efficacy predicts the metacognitive practice of engaging self-regulated learning strategies (Pajares, 2012). Self-efficacious students thus undertake the learning process with a positive mindset and are better able to maintain their course of learning. Emergent research suggests that ALSs can promote self-efficacy through system characteristics and the manner in which students and faculty interact. An adaptive assignment's smaller, attainable activities and mastery thresholds facilitate students' confidence and persistence (Foshee, Elliot, & Atkinson, 2016). Adaptive courses may even improve feelings of self-efficacy as a result (Liu, McKelroy, Corliss, & Carrigan, 2017). A course delivered via an ALS therefore can be contrasted with one based upon a textbook or other linear materials that present content as a monolithic body of content to be learned. In the latter type of course, the learning task can appear to be more daunting and challenges would be amplified to a general sense of inability.

Student feedback in the ALS survey is in alignment with the theoretical underpinnings of self-efficacy and its relationship to adaptive learning. A common theme is that students appreciated having their learning broken into smaller pieces since it improved the ability to self-regulate during the learning process. One representative example was the sentiment that, "I like how it does not overwhelm you with the reading. It gives you parts at a time, so you don't see a bunch of words and get scared." Students also liked frequent assessment of their understanding, both before and during their learning, since it provided them an opportunity to identify areas for practice. A comment in this vein was, "I like that it asks you questions—that way if I get something wrong, I have to re-do it to raise my score and that automatically helps me retain the material." What is clear from these and similar comments is that students viewed the system feedback positively and used it to inform their subsequent behavior in the learning process, both of which are hallmarks of self-efficacy.

TAWC also has improved the way it has adopted the ALS to make better use of design elements that can promote perceptions of self-efficacy. Initially, students were required to attain 70% on assessments in adaptive activities to proceed to post-requisite activities in the learning map. A common theme gathered via course evaluations and technology help requests was that students felt discouraged when, even after practice, they were unable to meet the threshold. Changing the threshold to 50% resolved these perceptions and conversely encouraged students to see areas of weakness as opportunities for improving mastery. Another modification that TAWC's implementation team put into effect concurrently was an incentive to engender constructive reactions in students when confronting challenges. The lever was a nominal bonus towards the overall assignment grade for each time (up to 10) that a student attempted to improve her mastery of an activity. These two design decisions resulted in increased completion rates for adaptive assignments, suggesting students had stronger positive feelings about their ability to persist in their learning.

## Learning Outcomes

Administrators at TAWC are just beginning to analyze the impacts of the ALS on student outcomes. Early results have been mixed, though there are some clear areas where the presence of adaptive learning has supported higher course grades and lower drop, fail, and withdrawal (DFW) rates. Students have achieved the greatest gains in math courses. Considering the introductory math course as an example, the mean class grade in the LMS (out of 100 points) during the 2016-2017 academic year when no adaptive learning was present ($M = 72.16$, $SD = 10.77$, $SE = 1.97$) was significantly lower than when adaptive learning was added ($M = 84.71$, $SD = 11.59$, $SE = 1.62$), $t(64) = -4.93$, $p < .001$, with a large effect size, $d = 1.12$. One possible reason for the gains in math courses is that the adaptive learning maps are based largely on discrete skills that have high degrees of pre-and-post-requisite dependencies. This can be contrasted with the majority of TAWC's adaptive courses that focus on knowledge acquisition and have tended to be less dependent on the pre-post-requisite model. Misconceptions or malformed understanding in the knowledge domain therefore present a lower threshold for enforcing mastery and less incentive for students to return to earlier challenging activities.

Another area that is promising is the application of the ALS in on-ground/hybrid courses. Among the nine courses with sufficient enrollment for statistical analysis, the mean student grade on a four-point scale in the non-adaptive on-ground versions ($M = 3.13$, $SD = 1.18$, $SE = .05$) was significantly lower than the mean student grade in the same courses after adaptive learning was added ($M = 3.47$, $SD = .68$, $SE = .07$), $t(216.8) = -4.13$, $p < .001$, with a small-to-medium effect size, $d = .37$. DFW rates in these matched pairs also dropped from 10.5% in the 2016-2017 and 2017-2018 academic years to 5.7% in 2018-2019. A likely cause for positive gains in student outcomes is the impact of ALS learning analytics in informing the way faculty teach during class meetings. In a survey, faculty provided the feedback that insights gleaned from adaptive learning maps and ALS analytics helped bring greater focus to the use of class time. Previously, there was not an opportunity to assess if students had mastered key concepts from the module prior to arriving in class. Instructors felt the insights from the ALS therefore allowed for the provision of instructional support on topics that were challenging for individuals or for the entire section.

## The SOUL Model: Universal Design for Learning Framework

Beginning in academic year 2017-2018, TAWC sought to augment students' agency over their learning, metacognition, and self-efficacy facilitated via the ALS by layering UDL principles into its online courses. As with the initial development of SOUL, the motivation was to ensure access, opportunity, and learning among those for whom traditionally-delivered higher education can present barriers, such as students with learning disabilities, whose first language is not English, and who may have been challenged in the K-12 system for a variety of reasons. While the ALS meets students' learning needs by personalizing learning, in adopting UDL in online and hybrid courses, TAWC sought to ensure scaffolded learning in support of all varieties of learners in almost the opposite way, by making learning as universally accessible as practicable. Students are the ones who personalize learning in UDL designed courses since learner choice is built into course designs. Adopting UDL practices required a reflection not just on learner's needs, but also the curriculum. As the founders of UDL note,

*...(T)he learner and the curriculum are just two definable parts of what is really a process or interaction. Strictly speaking, considering either part by itself—learner or curriculum—sets up a false dichotomy, as if we could assess either on its own rather than in relation to each other. Success...can only occur when the learner and the curriculum interact in ways that help them both improve at the same time. (Meyer, Rose & Gordon, 2014, p. 2)*

UDL perfectly aligns with SOUL's ALS, accelerated course schedule, wrap-around supports, and social and academic engagement. It utilizes methods, enhanced by technology, for shaping curriculum to meet individual student needs, optimizing learning experiences, and providing options to meet learning objectives in flexible ways, thereby enhancing equitable accessibility, engagement, and demonstration of mastery. TAWC's adoption of UDL has been applied through course development processes in some global methods across all courses and in some course-specific ways. As a means of ensuring adherence to UDL guidelines and best practices for online course accessibility and navigation, TAWC applies the UDL checkpoints and the Quality Matters rubric to all UDL course design projects (MarylandOnline, Inc., 2018). To date, TAWC has redesigned over 20 courses according to UDL guidelines, and by incorporating a pre- and post-redesign assessment of student performance in these courses, TAWC is able to concomitantly adhere to best practices and continuously improve curriculum.

## Engaging Students Through the Why of Learning

Learning happens best when the affective networks are engaged, when the student understands why she is learning a given lesson. As self-directed learners, adult students want to apply learning to their social roles, thereby increasing motivation (Knowles, 1984). The engagement of affective networks also enacts a student's interest, effort on a task, stick-to-itiveness, and self-regulation (Bandura, 1993; Duckworth & Gross, 2014; Dweck, 1986; National Academies of Sciences, Engineering, and Medicine, 2018).

To engage a brain's affective networks, the UDL framework suggests that educators build curriculum that recruits students' interest by empowering learners to take charge of their own learning (Bandura, 1993; Bandura, 1997), connecting learning to experiences that are meaningful and valuable (Knowles, 1984), and fostering a safe space to learn and take risks (Steele, 1997; Vygotsky, 1978). UDL best practices aimed at sustaining effort and persistence include setting a vision for why the goal matters (Knowles, 1984; Moskal, 2000), scaffolding student assignments to high expectations using flexible tools and supports (Vygotsky, 1978), cultivating a community of learners (Bushey, 2017), and guiding learning by emphasizing the role of effort and process (Bandura, 1993; Dweck, 1986, 2000). UDL guidelines for the affective networks' link to students' self-regulation include setting personal goals that inspire confidence and ownership of learning and increasing awareness around progress toward goals and learning from mistakes (Bandura, 1993; Elliott & Dweck, 1988; Paulsen & Feldman, 2005).

As previously discussed, TAWC's ALS supports the brain's affective networks by engendering self-regulation, agency, self-efficacy, and metacognition. UDL course designs support the affective networks by augmenting these same aspects, largely by facilitating student choice, autonomy, relevance and value. A universally applied principle in TAWC course designs is to align criteria with outcomes. The six weekly modules included in each online course contain required elements—course overviews, a to-do list with required readings, assignments, and discussion board activities. The course overview clearly indicates how program learning outcomes align with course outcomes and weekly course competencies. A UDL design element incorporated in some assignments is to require students to state how goals will be achieved. Another type of design element that TAWC utilizes is to include assignments with opportunities for self-assessment and reflection. These UDL guidelines enhance a student's sense of agency, her control over and responsibility for her learning, and her metacognition on how she is achieving her goals (CAST, 2018; Dweck, 1986, 2000; Flavell, 1979; Knowles, 1984; Vygotsky, 1978; Zimmerman, 2000).

TAWC's Women Empowered As Learners and Leaders (WELL) program includes three 3-credit courses, in which students articulate their reasons for returning to formal education as adults, identify strategies for pursuing these goals, and apply leadership skills and competencies gained through their curriculum in a final capstone project that addresses their goals. The WELL series therefore supports the UDL concepts of recruiting interest and eliciting motivation. Since all students are required to take the three WELL courses regardless of program of study, this is an important example of the UDL framework at work in TAWC curriculum.

Another example of providing opportunities for students to assume agency to capture interest and sustain motivation is witnessed in an early American history course, in which there are multiple ways students can accumulate content knowledge. The course contains primary source documents, such as Treasury Secretary Alexander Hamilton's 1790 letter to the Speaker of the House of Representatives and journalist Philip Freneau's op-ed articles opposing Hamilton's plan. The course provides opportunities to acquire content knowledge through short (20 minute) ALS lessons that incorporate formative assessment questions. The course also includes videos, such as a Cabinet Battle from the popular musical Hamilton, in which Jefferson and Hamilton outline their differing perspectives.

Another example is from an introductory biology course, which helps students understand why they are learning biological concepts and how these concepts apply to their worlds. Students are asked to consider how much biology they use in their everyday lives by writing a weekly journal paper that reflects on newspaper articles or television stories involving concepts from biology. Students start with a brief summary of the article, then include a description of how it relates to the course weekly topic, and conclude with a thoughtful reflection on the article. By identifying the biological content that is of interest to each student, motivation, agency, interest and self-regulation are enhanced (CAST, 2018; Duckworth & Gross, 2014; Dweck, 1986, 2000; Knowles, 1984; Zimmerman, 2000).

## Engaging Students Through the What of Learning

Recall has long been a well understood aspect of learning. More recent studies of the brain demystify recall's role in learning by highlighting the role of the brain's recognition networks, which represent the what of learning (CAST, 2018), or the content and knowledge needed in each discipline. Content is comprised of languages symbols, and through meaning-making of these symbols, students comprehend and acquire content knowledge (Vygotsky, 1978). Aspects of course designs that support learning processes in the brain's recognition networks help students create "hangers," on which they can attach new pieces of information in the brain's various "closets", or categorized filing and retrieval system (C. Smith, personal communication, February 17, 2010). UDL best practices support the recognition networks' focus on the use of symbols embedded in language to help students master content through the opaque world of symbols, so that educators can evaluate students' acquisition of new content knowledge, not facility with processing symbols.

The brain's recognition networks govern how information is perceived, processed, and understood (CAST, 2018). To tap into the brain's recognition networks, UDL guidelines suggest offering various ways that information is displayed, including alternatives for auditory and visual information; clarifying vocabulary, symbols (both language symbols and mathematical symbols), syntax and structure; including ways to promote understanding regardless of language used; illustrating via multiple media; providing background knowledge; eliciting themes and patterns; and augmenting application of knowledge from one domain to another (CAST, 2018). These guidelines facilitate meaning-making from and categorization of new information regardless of variances in brain processing and functioning.

Many of the examples related to the what of learning have been adopted as best practices across all TAWC courses. Instructional designers consider Web Content Accessibility Guidelines 2.1 (WCAG 2.1) when building courses into the LMS (Caldwell, Cooper, Guarino Reid & Vanderheiden, 2008). Academic program directors and instructional designers also add descriptive alternative text to all images, along with attributions. When alternative content is used in a different modality (such as YouTube, Kahn Academy, or internally created videos) to support text-based content, captioning is provided by an external vendor service (3Play Media) or a script is included. Books on tape, podcasts, or oral readings of text, when available, are embedded in courses to augment content knowledge acquisition.

Another example of course design practices that activate the brain's recognition networks is providing options for assignment submission. All too often, assignment submissions in formal education have been text-based, but the expansion of innovative technology allows for alternative methods for students to demonstrate the meaning they make of newly acquired information via formats that are most accessible to them. Where appropriate, UDL course designs offer multiple ways for students to demonstrate understanding, such as in a video, a visual such as an infographic or slideshow, or a traditional paper.

For example, following the UDL guidance to represent content in many and accessible formats, a WELL course focused on career development strategies uses robust language to describe images. Images help reinforce learning that is presented via text, but not all students interpret images in the same way, which may lead to misperceptions (CAST, 2018; MarylandOnline, Inc., 2018). In this career strategies course, visual imagery is augmented via vivid descriptions, so students who struggle with interpreting images have clear guidance on what concepts should be reinforced. Another example of supplementing images with text is in a course focused on human health, whose seven dimensions of wellness comprise a seminal concept. To reinforce understanding and aid recall, a graphic with circles representing each dimension, structured in a circular model of wellness, is described in detail, including colors for those who have trouble identifying colors. In the same course, a chart is analyzed and described in text so that course concepts are clear, to ensure learning across all students.

## Engaging Students Through the How of Learning

As the third aspect of brain processing, the strategic networks in the brain's frontal lobes control the how of learning. The how of learning can be thought of as the regulators of the brain's ability to act and express itself, in concert with other body systems. The strategic lobes' abilities to express and to undertake action drive a student's ability to communicate and engage executive functions for controlling learning (CAST, 2018). Since students' control of their learning is positively tied to persistence on task, determination, meta-cognition, and agency (Duckworth & Gross, 2014; Dweck, 1986, 2000; Knowles, 1984; Zimmerman, 2000), engaging the strategic networks is crucial to learning.

To capitalize on the strategic networks' action and expression capabilities, UDL best practices include varying methods for response and navigation; optimizing access to tools and assistive technologies; using multiple media for communication and multiple tools for composition; developing students' abilities with increasing levels of support for practice and performance; guiding goal-setting and strategic planning; assisting students in managing information; and growing students' abilities to monitor their progress (Caldwell, Cooper, Guarino Reid & Vanderheiden, n.d.; CAST, 2018). These UDL guidelines support students' self-efficacy, agency, metacognition and motivation by activating the power of the brain's strategic lobes in and of themselves, but they also serve to reinforce these crucial psychosocial determinants of learning by working in tandem with the brain's affective and recognition networks.

As with the why and what of learning, TAWC addresses the how of learning in some methods across all courses. For example, every course provides a rubric for each assignment with explicit directions to students to review rubrics before completing and submitting assignments (MarylandOnline, Inc., 2018; Moskal, 2000). To increase learner agency by providing students options with how they learn, the majority of the UDL course redesigns alter guidance on assignments to give students a choice in their submission type, rather than text-only submissions. As a result, these assignment redesigns necessarily require revised rubrics that can be used successfully to gauge competencies regardless of submission type. Where rubric criteria for text-based assignments included information on the length of written papers, UDL-based rubrics also provide time minimums for videos and number of slides for presentations, to ensure equitable demonstration of learning across submission types.

Two specific course redesigns illustrate elements to activate the brain's strategic networks. In an early childhood education course, an assignment on guiding classroom behavior that had formerly been limited to written papers was revised to include submission of a paper or a video. Instructions for using specific technologies, such as Google Slides, PowerPoint slides, Prezi software, and WordPress blogs, are provided. In the early American history course mentioned earlier, students can similarly submit discussion assignments by responding to the prompt in writing, making a video of themselves discussing the prompt verbally, making an infographic, or any combination of these alternatives. Guidelines on how to use video technology are embedded in the instructions, as is the language "The choice is yours!" This language emphatically engages the brain's strategic networks and supports student control over how to learn.

## BEST PRACTICES FOR IMPLEMENTATION OF THE SOUL MODEL'S TEACHING AND LEARNING FRAMEWORKS

In order to capitalize on the pedagogical innovations of these two frameworks, SOUL leverages technology supported by consistently applied academic policies and project management practices. SOUL is powered by an internally built data warehouse, which pulls in data from the student information system, the LMS (Canvas), the ALS, the customer relationship management system via which educator coaches maintain case notes on each student (SalesForce), the student financial aid system (PowerFaids), and various educational vendor tools (career readiness platform and online tutoring service, for examples). The comingling of these various sources of data in the data warehouse leverages reporting capabilities and data analysis, which facilitates the two teaching and learning frameworks by putting data about student, course, and assignment success in the hands of academic and educational technology staff. Below is a presentation of best practices that have facilitated the implementation of the ALS and UDL frameworks.

Because of its mission to support non-traditional distance-education students via its unique SOUL model, TAWC's academic staffing structure and its approach to curriculum design are similarly innovative. TAWC currently has eight academic program directors in a variety of disciplines. A few programs have a dedicated instructional and administrative staff member, either full-time or part-time, based on the enrollment size and curricular scope of the discipline. Lead instructors also provide additional program support and administration, under the guidance of the program director. Each program director is responsible for hiring, on-boarding, training, and overseeing the quality of instructors, and approximately 225 instructors teach the 750 courses offered annually through TAWC. While the academic program directors have responsibility for the curriculum and oversight of instructional faculty, ensuring student success and assessing student learning in these pedagogical frameworks is a collective, collaborative endeavor, as described below.

### Centralized Course Management

In order to meet the needs of its students supported via the SOUL model, TAWC developed, deployed, and maintains a centralized course management model. Each course in every academic program has been created and built in the LMS. Each time a specific course runs, scheduled according to students' graduation requirements, a course section is copied from the course master into the live section that is populated with students and the instructor. To build the course content and curricula, TAWC has a structured course development process that optimizes the use standardized tools and templates in prescribed course development phases with specific due dates and timelines.

Courses developed and maintained at TAWC in the centralized course management model are subject to continuous improvement both during the course development phases and when courses are running as live sections. During the course development phase, the academic program director and an instructional designer from TAWC's Academic Technology department both review the templates completed with course content, learning activities, and rubrics. As a course runs, instructors provide their feedback using the Course Feedback Form, whose data inform curricular enhancements and redesigns in a quality assurance process that closes the loop, a best practice in continuous quality improvement. Having say in the curriculum also serves as a form of investment, ownership, and motivation on the part of instructors.

## Curriculum Development

Academic program directors identify curricular priorities, courses that need to be revised or redesigned, and maintain a schedule of needed curricular updates and enhancements. Course design projects are scheduled into development phases depending on the time at which the updated curriculum would need to run. Once the schedule of course development projects is solidified in a bi-weekly Course Development Committee meeting comprised of academic program directors and instructional designers (a team of four full-time staff), the program director identifies any additional resources needed for the course projects. Typically resource needs include additional academic staff, specifically contracted subject matter experts (SMEs), but sometimes, depending on the curricular needs, resource needs could also include course materials, content, and experiential labs. The program director hires the SME(s) based on specific expertise required for the course content and discipline, as well as the capacity for working in this unique, collaborative, technology-supported course development process.

SMEs are required to complete course development training facilitated by instructional designers prior to starting any course development project. The online asynchronous mandatory training ensures that SMEs understand their role, the templates via which they will be submitting work, TAWC's pedagogical approach to curricular design, including adaptive learning and UDL, and the myriad ways that TAWC embeds quality assurance and compliance with federal guidelines into its curricular designs. TAWC's approach to course development is one of backward design, starting with the program learning outcomes and mapping them backwards into the most granular level learning activities or lessons and linking with pre-requisite, post-requisite and co-requisite concepts.

As the program director is hiring SME(s) for each course project, instructional designers generate and compile reports facilitated by the data warehouse to assess the success of the existing content. Sources of data and evidence include student course evaluations, which specifically ask about course design; course grades (including DFWs) and completion reports; data from the adaptive system on student mastery of granular-level course concepts; instructor feedback captured via the Faculty Course Feedback Form; and data from help desk tickets. Each course project's dedicated instructional designer shares this information with the academic program director for collaborative meaning-making and strategizing about the course design.

The course development phase starts with a conversation with the team—the program director, the SME(s) and the instructional designer—during which the program director provides guidance and the instructional designer lends design and process expertise. If a course is slated to be redesigned using the adaptive learning system or as a UDL course project, the program director and instructional designer discuss these pedagogical frameworks to identify where and how to embed them into course designs. The instructional designer also provides additional training, resources, and expertise on how the teaching and learning concepts will be brought to life in the course learning experience. The team then works collaboratively using templates, which are approved for quality assurance review by the program director, prior to the building of the course by the instructional designer. Before each course runs every session, whether a newly designed course or an existing course, both the program director and academic technology staff review the course for various aspects, to revise and repair content prior to becoming a student-facing learning experience. These standardized and centralized processes for course development ensure that the pedagogical innovations of adaptive learning and UDL principles are fully leveraged to support student engagement and personalized learning in each course.

### Faculty Training

New instructors at TAWC are required to complete an orientation prior to teaching a live course section in the LMS. This three week orientation to TAWC's educational model, philosophy, pedagogical frameworks, and policies and procedures is conducted online in the LMS in an asynchronous way and is facilitated by a member of the academic technology team. Orientation contains assignments that must be completed with an 80% or better in order for an instructor to teach at TAWC. In this setting, the training facilitator fosters a community of practice among TAWC's new online and hybrid instructors. Orientation in the LMS is a resource that remains available to instructors during their tenure at TAWC. Another set of higher-level faculty competencies is addressed in a second asynchronous training course for faculty, a micro-mastery series of modules of relevant instructional guidelines and policies. Instructors again progress through course content in a cohort that builds a community of practice. Instructors are specifically trained to teach in the adaptive system, and an advanced training course for teaching in the ALS is under development; the goal of this course will be to ensure that instructors are fully leveraging the ALS to engage students. These best practices for training course instructors ensure the frameworks of adaptive learning and UDL are optimized to support student learning.

## FUTURE RESEARCH DIRECTIONS

Early indicators of student success have strengthened confidence in the SOUL model and in the compatible pedagogical frameworks of ALS and UDL. Persistence from one 6-week session to the next is high, and retention from one academic year to the next, while lower than session to session persistence, is also strong. Most significantly, six year graduation rates are twenty-five percent higher than comparable national averages for the cohort of adult women age 25 or older who attend private or public higher education institutions (Shapiro, et al., 2019).

While the SOUL model shows promise, more research on online student engagement and learning agency leveraging these frameworks is needed. TAWC should continue to analyze data from the ALS to compare and contrast gains in learning and competency mastery in adaptive learning courses versus more traditional online courses. This should include macro-level (i.e., at the course level, in terms of grades and passing rates) as well as at the micro-level (i.e., at the granular level of the learning modules and activities, in terms of concept mastery) analyses. When student enrollment is sufficiently high in

UDL redesigned courses, TAWC should evaluate pre- and post-UDL redesigns to understand whether the UDL framework is yielding benefits to TAWC student success as intended. TAWC should also continuously apply analytics capabilities to its intervention strategies, to determine the most impactful touchpoints for student learning and success. Another important next step for research would be to collaborate with other institutions supporting online adult learners to understand their best practices in using similar frameworks and analyze their online student learning engagement metrics and outcomes. Finally, while quantitative data on student success are crucial, qualitative understandings of students' and faculty members' experiences and perspectives should also be harnessed to improve online student success.

## CONCLUSION

The higher education ecosystem of the future will depend on a much more digitally connected environment for learning, virtually collaborating, and social networking. Students are already moving toward a realm of 'self-service' to obtain just-in-time information and training, and will need to be better equipped with skills such as cognitive load management and computational thinking, in order to decipher what knowledge and skills are vital at what points in time and obtainable from credible sources. Higher education will need to be increasingly focused on preparing students to make meaning of their learning in relation to work and career, incorporating long-standing theories of learning and pedagogy with modern technology-enriched environments and methodologies. The frameworks of adaptive learning and UDL described throughout this chapter are intended to provide such an example.

The American Women's College's SOUL model was designed to promote degree completion through a constellation of evidence-based practices and wrap-around supports that cultivate student engagement in a personalized online learning environment. Foundational to this model is the commitment to leveraging technology to gather a wealth of data to drive action-oriented analytics, which trigger interventions by faculty and staff to enhance persistence, course progress, and degree attainment. The SOUL model, which embeds the pedagogical frameworks of ALS and UDL frameworks into online curriculum, employs high-tech, high-touch practices for intentional and personalized targeting of resources that prove most effective at improving online student engagement in learning.

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## KEY TERMS AND DEFINITIONS

**Academic Program Directors:** Educators who oversee curriculum in respective disciplines in TAWC's centralized course model.

**Adaptive Learning:** Learning system built around a set of AI algorithms that process data drawn from tens of thousands of learner interactions, whose computations are designed to discern the best content to deliver to a student based upon their prior knowledge, pace of learning, preferences, and many other variables, resulting in no two students experiencing the same course in exactly the same way, though all students ultimately achieve the same learning outcomes.

**American Women's College:** Adult women's undergraduate division of Bay Path University offering online and hybrid courses in over 40 academic programs.

**Data Warehouse:** Repository of data from adaptive learning platform, learning management system, student information system, customer relationship management application, and other technology tools and applications used to inform business operations and power predictive analytics.

**Educator Coaches:** Professionally-trained advisors engaging in proactive, data-driven interventions.

**Instructional Designers:** Designers who build and maintain courses in the learning management system.

**Social Online Universal Learning:** Online educational delivery model powered by technology and data, serving adult students at The American Women's College.

**Subject Matter Experts:** Academics with deep expertise in a particular discipline who identifies and creates course content, assignments, and assessments under the guidance of Academic Program Directors.

**UDL:** Universal design for learning curricular guidelines for multiple means of engaging students, representing content, and demonstrating learning, promoting universal accessibility.

# Chapter 16
# Online Collaborative Learning in Pre-Service Teacher Education:
## A Literature Review

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## ABSTRACT

*Technology-enhanced collaborative learning has become attractive in higher education. Teacher education programs have made extensive efforts for meaningful use of online technologies for collaboration and communication. This review aims to synthesize a comprehensive literature review on PSTs' collaborative learning with online tools. First, the review revealed that the number of articles published has increased especially in the last five years with contributions from researchers around the world. Second, there were three types of online technologies used mainly for collaboration in PST education: Asynchronous, synchronous, and social media tools. Third, online tools for collaboration were reported as mainly beneficial in PSTs' education contexts. Forth, while there are notable exceptions, challenges to integrate online collaboration tools in PSTs' education programs were scant. Finally, there were various instructional practices where educators integrated online collaborative tools for learning. Future research directions are elaborated.*

## INTRODUCTION

In the last two decades, the use of the technology to support learning in higher education has increased worldwide. This growth enabled new forms of technology-enhanced communication and collaboration for learning. There are many emerging online tools for collaboration, and they can notably vary from each other. Emails, blogs/microblogs, wiki, discussion boards, voice over internet protocol, web conferencing systems, real-time collaborative editing, shared spaces, text messaging, instant messages or chats are examples of online means that support collaborative learning.



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Technology-enhanced collaboration in higher education settings has attracted a rapidly increasing number of research studies investigating various aspects of learning from theoretically diverse perspectives (Resta & Laferriere, 2007). To date, there are also a number of studies examining the effectiveness of instructional technologies in teacher education programs and how students learn to use such technologies. However, there is no consolidated picture on how online collaboration occurs in preservice teachers' (PSTs) education and what online tools are used for professional development. Also, research on technologies in teacher education has mostly investigated student learning about technologies rather than learning with them (Baran, 2014). This review aims to synthesize a comprehensive literature review on PSTs' collaborative learning with online technologies. There are previous literature reviews researching web 2.0 technologies in higher education (Conole & Alevizou, 2010); mobile technologies in pre-service and in-service teachers' development (Baran, 2014); and internet-based technologies for collaborative learning in higher education (Resta & Laferriere, 2007). However, there is no recent systematic research has been conducted on online collaboration tools and implementation strategies of those tools to promote learning and student engagement in pre-service teacher education programs. Comprehensive description and evaluation of tools and strategies is a necessary step, then, to guide researchers, administrators, and educators.

The purpose of this paper is to identify strategies used to incorporate online collaboration tools into pre-service teacher education. The main underlying question of this review is how online collaboration occurs in pre-service education and what are the types of online collaboration used for teacher education. The majority of previous studies group online collaboration tools into two broad categories (synchronous and asynchronous) based on the time frame the communication occurs. Asynchronous online *learning*, most commonly enabled by e-mail and discussion boards, supporting class-related connections among students and with instructors. This type of collaboration doesn't require learners be online at the same time and is mostly benefited by learners who combines education with work, family, and other duties. Another advantage of asynchronous interaction is that students may have more time cultivating and generating their contributions (Hrastinski, 2008). *Synchronous collaboration*, commonly facilitated by videoconferencing and chat. This type of collaboration for learning provides opportunities for more social connections among students and with instructors and this might help avoid frustration by asking questions and getting answers in real time (Hrastinski, 2008). There is a recent study adding hybrid tools as a third category (Wahl & Kitchel, 2016). In a comprehensive literature review study, Wahl and Kitchel (2016) listed effective professional distance collaboration tools into three types: Asynchronous, synchronous, and hybrid tools. Those are; asynchronous (emails, blogs and microblogs, wiki, discussion boards, etc.), synchronous (voice over internet protocol, web conferencing systems, real-time collaboration or real-time collaborative editing, etc.), or hybrid tools (shared spaces, text messaging, instant messages or chat, etc.). Asynchronous tools assist users to do works independently and share them with offline users. They also connect users in the different geographic region or time zone (Wahl & Kitchel, 2016). Synchronous collaboration, on the other hand, is location free but occurs at the same time. Most synchronous tools enable learners in distant locations to connect with one click, engage them virtually with instructors, other learners, and/or experts who would not be available on campus (Dyment & Downing, 2018). Finally, Wahl and Kitchel (2016) define hybrid tools as spaces that can offer collaborative methods that are not always available with other two types of resources. Hybrid tools work both synchronously and asynchronously depending on the user and the situation.

Based on the 27 empirical research reviewed, social media platforms appeared as popular tools to support online collaboration for PSTs' learning. The reviewed research studies that are focusing on the use of social media for PSTs' collaboration was critical to include in this literature review because they demonstrated more opportunities for understanding how social media platforms might specifically assist PSTs' collaboration for advancing learning and engagement (Chuang, 2016; Colwell & Hutchison, 2018; Carpenter et al., 2016; Habibi et al., 2018; Krutka et al., 2014; Rutherford, 2010; Sun, Lin, Wu, Zhou, & Luo, 2018). Thus, social media was represented in a distinct category to demonstrate their benefits that might be unique for students' social interaction and engagement.

## BACKGROUND

### Constructivism

Constructivism is a theory about how people learn. In teaching and learning, the constructivist view can point towards a number of different teaching practices in which teachers are facilitators of the learning and thinking process (Liu & Chen, 2010). In this view, students are expected to be actively responsible for their own learning. Therefore, in the constructivist approach, learning includes "constructing, creating, inventing, and developing one's own knowledge and meaning" (Liu & Chen, 2010, p.65).

Constructivist approaches in teaching and learning environments have originated from pioneers of psychology, Jean Piaget, and Lev Vygotsky. There are two major different strands of the constructivist perspectives. These are social constructivism and cognitive constructivism. Piaget's cognitive constructivism theory discusses the process of knowledge gain is individually constructed and learner-centered while Vygotsky's social constructivism believes that social environment and social interaction have a major role in one's knowledge construction (Liu & Matthews, 2005). Social constructivism incorporates collaboration and communication in a way that teaching becomes highly effective and beneficial for students (Liu & Matthews, 2005).

This study builds on Vygotsky's social constructivism theory to recognize how online collaboration might be helpful for preservice teachers' development and collaborative learning. There are various tools used to facilitate online collaborative activities for learning in teacher education programs and this study aims to provide a comprehensive literature review to demonstrate the applications of virtual collaboration occurring in pre-service education programs and the types of online collaboration used for teacher education.

### Collaborative Learning

Collaborative learning has begun to attract educators' attention in the last two decades. Teacher educators and teachers use this approach to reform passive learning and to create more student participation and interaction (Barkley, Cross, & Major, 2014). Collaborative learning has the potential to remodel instruction by changing the roles of learners and teachers and engage students as active participants and co-creators of knowledge (Goodsell, 1992).

Dillenbourg (1999) distinguished the terms cooperative and collaborative learning. Dillenbourg (1999) defined cooperative learning as is "a protocol in which the task is in advance split into sub- tasks that the partners solve independently" (p.8). Collaborative learning is described as situations "in which two or more subjects build synchronously and interactively a joint solution to some problem" (p.8). This distinction pictures the type of the interactions that occur within groups of students in collaborative environments. With cooperative tasks, participants could divide a task into the elements and distribute those across group members who would work independently and then combine their work for the final artifact. On the other hand, collaboration has a critical component which is the student discussion occurring during student engagement within the task.

## Online Collaboration and Student Engagement

The integration of online communication tools has allowed students quickly convey knowledge and feedback on tasks by managing the physical distances. Mere communication tools should be distinguished from the tools supporting collaboration. Based on the suggestions of Lomas, Burke, and Page (2008), the following features can distinguish communication and collaboration tools: Strong communication capability, easy to use interface, capability for collaboration (p.4). As replacements of face-to-face interactions, recent online collaboration tools provide communication via text annotation, video, audio, and other communications allowing multiple users to work on tasks from different locations. Second, the tools' interface should be easily understood and applied in learning environments without requiring training. Last, the collaboration tools should be clear on the expectations from participants to collaborate, such as when and how to interact with each other (Lomas et al., 2008). All these features are critical to promote collaborative learning via online means because simply putting students in online groups does not guarantee that collaborative learning will occur. However, learning may be ensured when several factors considered in designing online collaboration and these are task, group size and composition, content specifics, individual learner differences, and finally the technological tool used for collaboration (Hathorn & Ingram, 2002).

Alavi (1994) underlines three attributes that need to be in place to facilitate effective learning processes through computer-mediated collaboration. They are; "active learning and construction of knowledge, cooperation and teamwork in learning, and learning via problem solving" (Alavi, 1994, p.161). He also notes that numerous benefits can be derived through the computer-mediated collaborative learning (Alavi, 1994). For example, such collaborative learning models in higher education settings lead to more collaboration and interaction resulting in higher level thinking and deeper learning (e.g. Garrison, Anderson, & Archer, 2001). It also provides opportunities for developing communication, working relationships, problem solving skills, increasing student involvement with the subject matter, student learning, and achievement (e.g., Raman & Ryan, 2004; Wahl & Kitchel, 2016).

Technology-enhanced collaborative tools can offer various activities and opportunities for learning. According to Lomas and his colleagues (2008), such tools be grouped as follows: Immediacy (text or chatting), enhanced voice communications (Skype, phone calls, etc.), ambient communications (e.g. Twitter), image sharing (e.g. Flickr), document construction (e.g. Google docs), social interaction (e.g. Facebook), geographic richness (e.g. Google Earth) (p.5). Overall, a good collaboration tool should encourage communication by sharing a diagram, photograph, paper, or similar objects; allow natural interactions; and be easy to use and learn (Lomas et al., 2008).

Student engagement embodies the time and effort students spent in educationally purposeful activities such as studying and co-curricular activities (Kuh, Kinzie, Cruce, Shoup, & Gonyea, 2007). In one other study, student engagement was defined as the interest and motivation students have in their own learning of content (Young & Bruce, 2011). As student engagement increases, students' academic achievement and persistence might increase as well (Kuh et al., 2007). Previous research suggested that student engagement in online communities might depend on several factors, including (i) online activities being active and collaborative, an instructor's connection with students (Mandernach, 2009); (ii) previous experiences in online learning, and (iii) the students' level of responsibility for their own learning (Richardson & Newby, 2006). Dixon (2010) classified online learning activities as active and passive. Active learning practices include online discussions, online lab activities, problem solving activities, group projects while passive ones are test taking, reading, watching PowerPoints and video lectures. He claims that the online learning activities requiring more interaction with the content, instructor, and/or peers result in higher levels of student engagement.

## THE STUDY

### Methods

The design of this review qualifies as a systematic qualitative review (Green, Johnson, & Adams, 2006). The review process will follow the three main steps of a systematic literature review. These are retrieval, selection, and analysis of the literature (Galvan & Galvan, 2017).

### Search Strategies

For this comprehensive search of the literature, key search terms used were varied in order to collect all relevant studies across the various digital tools. Since many of these tools are emerging or continuing to evolve, names and definitions are not consistent across publications. Key terms and phrases used included digital/virtual/online collaboration in pre-service teacher education, emailing, computer-mediated communication, asynchronous/synchronous collaboration tools, blogs, wikis, discussion boards, forums, social networking, and Web conferencing in pre-service teacher education.

The publications were limited to English language papers within the pre-service teacher education context and within the last decade (from 2009 through 2019) where there has been a rapid increase in the use of educational online technologies. Authoritative electronic databases were searched such as ERIC (*Education Resources Information Centre*), Education Research Complete, Google Scholar, and Proquest. Key terms were also applied to the following primary research journals: Journal of Educational Technology and Society, Computers and Education, British Journal of Educational Technology, Educational Technology Research and Development, Journal of Technology and Teacher Education, Journal of Research on Technology in Education, Journal of Online Learning and Teaching, Journal of Digital Learning in Teacher Education Australian Journal of Teacher Education. Moreover, references in each of the identified articles were checked for related work. Further searches were conducted through hand searching, and consulting with experts in the field.

For the final step for the research synthesis, inclusion criteria were applied to ensure the articles included: (a) empirical research on online collaborative learning tools in preservice teacher education contexts across different disciplines (e.g., social studies, literacy, and math); (b) applications of online collaborative learning technologies (e.g., discussion boards, wikis, web conferencing, etc.) in a teacher education context; (c) preservice teacher participants; and (d) publication in a peer-reviewed journal, rather than a technical reports or conference proceedings. After applying the search criteria during the literature search process, all remaining articles were included in the analysis. Therefore, the number of peer-reviewed articles examined for this structured literature review was 27.

## Writing the Literature

To thoroughly explore the key focus, each of the empirical studies was revisited and reviewed in more depth. The author took notes on the methodology used, sample size, content area, the country where the study was conducted, the types of online collaboration technologies integrated, and what were the key findings. In order to write a detailed review, the drafted short notes and then the studies were revisited.

As shown in Table 1, the selected literature was drawn from a wide range of content areas in teacher education programs. The key studies were drawn from a wide range of publications in Europe, Australia, Middle East, Asia, and North America and had a great variety of purposes (or central focus). In the next section, the studies were reviewed with respect to types of online collaboration tools used.

*Table 1. Analysis of studies on online collaborative learning and teacher education*

| Authors and year | Subject domain | Country | Type | Data sources | Technology |
|---|---|---|---|---|---|
| Badilla Quintana, Vera Sagredo, & Lytras (2017) | Language, communication, ESL | Chile | Mixed methods | Observation grids and personal log books | Virtual learning environments |
| Carpenter, Tur, & Marín (2016) | PSTs (not specified) | U.S. and Spain | Mixed methods | Survey and reflections | Twitter |
| Chuang (2016) | PSTs (not specified) | Taiwan | Qualitative | interviews | Google sites |
| Colwell & Hutchison (2018) | Secondary literacy teachers | US | Qualitative | Open-ended questionnaire blog reflections | Twitter |
| Connor (2018) | Science education | US | Qualitative (case study) | Video and discussion board | Virtual reality environments and discussion forum |
| Donne (2012) | PSTs (not specified) | US | Qualitative (case study) | Reflections | Wiki |
| Dyment & Downin (2018) | Secondary education (multiple disciplines) | Australia | Mixed methods | Questionnaire, interview messages/posts on WC | Web conferencing |
| Enochsson (2018) | Secondary education | Sweden | Qualitative | Video-recorded and written online discussions | Discussion forum |
| Garcia & Hooper (2011) | PSTs (not specified) | US | Qualitative | Interview, field notes, and student artifacts | WebCT course site |
| Giacumo Savenye, & Smith (2013) | PSTs (not specified) | US | Quantitative | Discussion board posts, pre and post tests | Discussion board |
| Habibi et al (2018) | English as a foreign language (EFL) | Indonesia | Qualitative (case study) | Interview | Whatsapp, Telegram, Email, and Google Form. |

*continues on following page*

*Table 1. Continued*

| Authors and year | Subject domain | Country | Type | Data sources | Technology |
|---|---|---|---|---|---|
| Hambacher Ginn, & Slater (2018) | Elementary and secondary education (Multiple disciplines) | New England | Qualitative | Interview | Discussion forum |
| Hamel (2012) | Secondary education | Canada | Qualitative | Interview, survey | iVisit, Skype, VIA, discussion forum |
| Keamy & Selkrig (2013) | PSTs (not specified) | Australia | Mixed methods | Survey | Blackboard Collaborate |
| Krutka et al (2014) | Middle/secondary Education (multiple disciplines) | US | Mixed methods | Posts, questionnaire | Social networking site Edmodo |
| Krutka, Bergman, Flores, Mason, & Jack (2016) | Science | Finland | Quantitative | Questionnaire | Wiki |
| Matthews & Johnson (2017) | Music | US | Qualitative | Survey (pre and post-test) and open-ended questionnaire | Blogs, Google tools, and Skype |
| Namdar (2017) | Science | US | Mixed methods | Students posts and audio | Wiki |
| Nicholas & Ng (2009) | Science | Australia | Mixed methods | Questionnaire, open-ended questions, interview and online messages | WebCT, wikis, blogs, and Google Docs |
| Ruane & Lee (2016) | Elementary education | US | Qualitative | Online discussions | Discussion board |
| Sahin & Uluyol (2016) | Elementary education | Turkey | Quantitative | Questionnaire | Emailing, networking, document and video sharing, blogging, chatting |
| Satar & Akcan (2018) | English as a foreign language (EFL) | Turkey | Mixed methods | Discussion posts | Discussion forum |
| Savard, Lin, & Lamb (2017) | Mathematics | Canada | Qualitative | Online discussions | WebCT Vista platform |
| Sun Lin, Wu, Zhou, & Luo (2018) | Information technology | China | Mixed methods | Learning interactions questionnaire | Discussion forum and WeChat |
| Uzunboylu, Genc, & Tugun (2017) | Counselling, Special education, computer science | Turkey | Quantitative | Questionnaire | Online social networking |
| Yang (2009) | English as a Foreign Language (EFL) | Taiwan | Qualitative | Blog posts, surveys, instructor's observation notes | Blog |
| Yeh (2010) | Secondary education | Taiwan | Mixed methods | online group discussions, portfolios, peer evaluation forms | E-learning platform |

## SOLUTIONS AND RECOMMENDATIONS

A synthesis of the published research literature revealed that distance collaboration tools in teacher education programs can be grouped by type and these are asynchronous, synchronous, or social media tools. This section reports the findings and recommendations from the previous literature for each type separately. The majority of previous studies group online collaboration tools into two broad categories (synchronous and asynchronous) based on the time frame the communication occurs. Based on the reviewed empirical research, this study classifies online collaboration tools into three categories: Synchronous, asynchronous, and social media, which might be used any time. The social media category does not necessarily

### Asynchronous Tools

Based on the reviewed literature, asynchronous technology tools appeared as the most common way of collaboration implemented in teacher education programs in the last decade. The studies focused on the following means of collaboration: blogs, wikis, discussion boards, emails, texting, and Google Docs. Yang (2009) conducted a study on 43 PSTs whose major is English as a Foreign Language in Taiwan to explore the use of blogs as a reflection platform. He found that technology is a useful platform for critical reflection and communication with each other. Namdar (2017) also found that the use of Wikis in science PSTs' education increases learning both in the individual and collective levels. Donne and Morris (2012) studied the experiences and reflections of 48 PSTs' who enrolled in a face-to-face graduate course supplemented with online activities. They concluded that the use of a wiki throughout the course facilitates gaining new knowledge and modeling technology integration into the classroom. Therefore, PSTs become motivated to use such technologies in their future classrooms to foster students' engagement. After investigating the usefulness of asynchronously used several communication tools (email, MSN, wiki, blogs, SMS, Google Docs, WebCT), Nicholas and Ng (2009) suggested that online tools allowing asynchronous collaboration increase PSTs' positive attitudes toward the learning experience, technology skills, and tendency of making new friends.

Satar and Akcan (2018) found implementing online discussion platforms in a teacher education course improved pre-service EFL teachers' online participation skills, interaction, and social networking. Such a learning experience can also be helpful for PSTs to develop an awareness of the behaviors required to enable their future students' engagement in online learning (Satar & Akcan 2018). Garcia and Hooper (2011) conducted a study where teacher candidates participated in a 4-week online critical literacy seminar. Findings indicate the use of discussion board along with a reading strategy were effective in increasing critical thinking and problem-solving skills. Consistently, Matthews and Johnson (2017) also reported that having students use asynchronous collaboration spaces to work on assignments increased their self-confidence and reflective thinking skills, as well as helping them recognize the effectiveness of online collaboration for their future classroom uses. Ruane and Lee (2016) conducted an eleven-week collaborative project to study exploring the use of online peer mentoring site in undergraduate music education with participants from two separate universities. Supporting the previous studies, they found that the online peer mentoring site promoted ideas and knowledge exchange, collaborative learning, and professional communications among first-year and third-year students.

Student familiarity with the tools and the ease of use are important factors to increase interaction. Prior Instruction in the use of the technologies is needed to master students' technical knowledge that would positively influence the quality of discussions (Enochsson, 2018). Supporting this finding, a number of studies highlighted the need for explicit guidelines for PSTs that outlines how to facilitate an online discussion, how to comment, critique, and build on each other's ideas. According to previous studies, the written guidelines such as rubrics or prompts increase teacher presence in the asynchronous discussion (Giacumo et al., 2013; Hambacher et al., 2018). Overall, these studies pointed that increased teacher presence and systematically planned asynchronous discussions would promote engagement, higher order thinking skills, students' performance, and satisfaction in the online learning environment (Giacumo et al., 2013; Hambacher et al., 2018).

Although the majority of the studies indicated the advantages of using asynchronous tools for online collaboration, there are some issues with the use of such tools raised in the previous studies. According to Nicholas and Ng (2009), one potential problem is related to the delay in responses and feedback. Another issue with the asynchronous learning platforms is to the possibility for unequal contribution among team members (Nicholas & Ng, 2009). The beliefs of the PSTs in terms of online collaborative learning were also mixed. About one-third of the participants were unsure of the effectiveness of this type of learning over face-to-face learning (Nicholas & Ng, 2009). Savard and his colleagues (2017) examined the mathematical knowledge for teaching that PSTs used when participating in an online community before entering a field experience. After analyzing of online discussions, they found that the majority of discussions revealed a superficial view of teaching focusing on general teaching ideas rather than deepening talks into content-specific teaching strategies and describing classroom or student-specific situations. Overall, these studies suggest that asynchronous tools might be highly effective when the activities were systematically designed, and the expectations were clearly defined to support the teacher presence.

## Synchronous Tools

The reviewed studies suggest that virtual reality platforms and video-conferencing through Skype, iVisit, VIA, etc. were common tools that has been used to facilitate synchronous collaboration in PSTs' education. Hamel (2012) conducted a study to understand the impacts of remote supervision in an iterative collaborative model established via video-conferencing (iVisit, Skype, and VIA) and an electronic forum. The results show that the practicum can be successfully employed via video-conferencing and the electronic forum where PSTs communicate and increase the interactions between them. Also, the option to record meetings in the video-conference application was suggested as it was found to be helpful. According to the findings, this feature allowed (i) instructors observe the PSTs in real-time and (ii) PSTs access to the recordings in order to analyze their classroom practice. The tool was also found to be helpful to avoid professional isolation and develop a shared environment for exchanging ideas on teaching practices (Hamel, 2012). In a more recent study, Dyment and Downing (2018) explored secondary PSTs' experiences in weekly web conferences in Australia. They found that web conferences allowed the PSTs to participate in meaningful professional conversations and develop teacher professionalism. And, when compared with face-to-face interactions, synchronous interactions prompt a deeper level of engagement, satisfaction, and sense of achievement. Keamy and Selkrig (2013) pointed out that having structured protocols or guidelines to establish communication during synchronous discussions is critical for PSTs' ultimate benefits. They found that the protocols positively contributed to student engagement while ensuring everyone has equal time to discuss, present their work, and receive peer feedback.

Badilla Quintana and his colleagues (2017) studies PSTs' skills and perceptions about the simulation tasks (pedagogical practices) thorough Immersive Virtual World. The results show that the PSTs improved their technology skills and understanding about good practices in classes through peer assessment on teaching performance. The main difficulties identified during the development of the activities in the virtual learning environment were technical in nature, reporting hardware and connectivity issues. In a recent study, O'connor (2018) found that virtual reality meetings designed as peer discussions throughout the course can support the development of collegial sharing, collaborative problem-solving skills, and content knowledge. Follow-up discussion board interactions after virtual reality meetings found helpful to give the instructor insight into students' understanding and possible areas that may need more instruction. Overall, the studies above suggest that guidelines for the online interactions must be clear to increase the quality of student engagement and follow-up asynchronous discussions might help to advance PSTs' learning outcomes.

## Social Media

The use of social media platforms in teacher education programs has been increased in more recent studies, especially in the last five years. A previous study investigating PSTs' perceptions about the social networking site Edmodo as a collaborative reflection tool found that it's Facebook-like interface and accessibility on any mobile device were highly useable (Krutka et al., 2014). According to Krutka and his colleagues (2014), PSTs' engagement on Edmodo went beyond describing events in field experiences and engaged them in a more helpful discussion about future teaching practices. Overall, PSTs valued peer-to-peer interactions as peers contributed to their professional growth and evaluation of pedagogical decisions. Rutherford (2010) investigated the impact of using social media (Twitter, Facebook, Sakai, etc.) on student engagement. He found that interacting with their peers and instructors by using social media may allow students to get to know them better. And, this could create supportive learning communities where students are comfortable to collaborate, share opinions, and provide constructive responses to the ideas of their fellow students. The findings also indicated that there was a positive correlation between the frequency of student use of social media and how they describe the overall quality of instruction and the preservice program (Rutherford, 2010).

Another study conducted a survey on 153 PSTs in the U.S. and Spain who used Twitter during course work and examined their perceptions of Twitter as a collaboration tool for professional development (Carpenter et al., 2016). Twitter has been found as a very helpful collaboration tool for PSTs from both countries although U.S. participants were more positive about the use of Twitter as a future collaboration tool. The study suggests that Twitter have the potential to facilitate learning and collaboration among PSTs and with other educators as providing the microblogging service. On the other hand, PSTs from both countries were less positive about the use of Twitter with their future students. Colwell and Hutchison (2018) explored secondary PSTs' experiences of active and continued participation in and developing a Twitter-based professional learning network within their discipline. The results suggest that Twitter is powerful to expand PSTs' network beyond peers in the course and develop interactions with discipline-specific educators or experts to promote PSTs' understanding of the content.

Habibi and his colleagues (2018) examined PSTs' perceptions of the advantages of using Social Networking (WhatsApp, Telegram, Email, and Google Form) in an English teacher education program in Indonesia. Based on the findings of the study, using those platforms were resulted in increased social interaction (peer discussion and interaction with supervisors or instructors) and increased learning motivation and experience. Ease of communication and saving time were other advantages of such platforms because of providing flexible collaboration among student teachers anytime and anywhere (Habibi et al., 2018). Another recent study compared the uses of an online discussion forum against such use of an instant messaging application (WeChat) by a group of 78 PSTs in China (Sun et al., 2018). It was found that while both tools enabled collaborative learning, they appeared to have different advantages. Specifically, using the online discussion forum resulted in more communication aimed at knowledge construction, while using WeChat resulted in more social interactions. Finally, Chuang (2016) explored the roles played by social media in facilitating a learning community through the implementation of a three-stage 18-week program of online group collaborative learning intervention. Although no real-time face-to-face interaction could be both social and an emotional challenge for students, social media such as Facebook helped to build social presence and communication among group members.

## FUTURE RESEARCH DIRECTIONS

This systematic review proposes a number of critical future research directions for those who plan to investigate the integration of online collaboration technologies into teacher education contexts. First of all, the majority of the research conducted on online collaboration for learning in teacher education presents survey and case studies conducted with small sample size. While these reveal critical findings, future empirical research can use other methodological approaches such as design-based research and ethnography. This would be helpful to understand how learning through online collaboration outside of the class relates to aspects of teacher education socially and culturally. Studies with larger samples would also be desirable. Second, many previous studies focused on the advantages of online collaboration tools on PSTs' engagement, technology skills, and pedagogical learning. Besides to benefits, understanding the potential associated challenges are critical to gaining greater insight into the various stages of teacher education and the role of online collaborative learning in each. Third, there were only two studies reviewed recognizing the effectiveness of online collaboration for their future classroom uses. There is more research needed to explore how the integration of online collaboration tools in teacher education would possibly influence PSTs' uses of such tools with their future students.

This study reviewed the previous research on PSTs' learning through online collaboration tools rather than PSTs' learning about online technologies, which was widely investigated in the literature (Baran, 2014). There is still more research is needed to understand how PSTs' and teacher educators' professional development can be supported with online collaboration tools. Additional research may also consider how teacher educators might increase the use of such tools in teacher education and possibly use them for their own collaborative professional development activities. The research on professional learning through online collaboration in specific teacher education contexts can potentially be extended to the entire teacher education programs and other disciplines in the higher education institute where more research is needed. Different ways for virtual tools' integration for collaborative learning into higher education can be examined, such as the implementation in practicum/internship, special courses (content, methods, labs, etc.), and throughout various programs at the university. Finally, online technologies covered in this chapter seem to have an inherent potential for enabling global collaboration and learning. Future research could explore the possibilities for the creation of international communities among pre-service teachers, and/or teacher educators around the world. Such cross-cultural experiences could help participants become a world educator.

*Table 2. Summary of major findings*

| | |
|---|---|
| **1** | The review revealed that the number of articles published has increased since 2009, especially in the last five years, with contributions from researchers around the world. |
| **2** | There were three types of online technologies used mainly for collaboration in PST education: Asynchronous tools, synchronous tools, and social media platforms. |
| **3** | Online tools for collaboration were reported as mainly beneficial in teacher education contexts. |
| **4** | Guidelines for the interactions/ activities through any type of virtual tool must be clearly given to learners to increase the quality of engagement. |
| **5** | Follow-up asynchronous discussions after synchronous collaboration might be helpful to advance PSTs' learning outcomes. |
| **6** | There is an increase in the use of social media platforms in teacher education programs especially in the last five years. |
| **7** | While there are notable exceptions, challenges to integrate online collaboration tools in teacher education programs were scant. |
| **8** | There were various instructional practices where educators integrated online collaborative tools for learning: Practicum, field teaching, peer teaching, assignments, group projects, follow up discussions, professional communications across disciplines and across universities, and connecting with experts around the world. |

## CONCLUSION

This systematic review of 27 articles on online collaborative learning and teacher education is timely in light of growing interest in online learning and a lack of syntheses in the context of teacher education. Findings are drawn as well as the approaches and strategies for implementing online collaboration tools in different teacher education contexts. Summary of major findings are presented in the Table 2 below.

There are potential practical applications that this study recommends for the educators. It is important that pre-service teachers, faculty, and those who support them with instructional technology have models to draw upon. This review indicates that online collaboration tools are important means that need more implementation in ways that increase learners' engagement. First, online collaboration tools have potential to facilitate supervision, reflection, and/or communication. While preservice teachers being placed in real classrooms where they teach and/or observe real students as in the traditional field-based approach, faculty can observe them by using video-conferencing technologies for synchronous observations of classroom lessons and possibly even interaction with the teacher. Second, different types of online collaboration tools and the topics (e.g., content related, pedagogy related) for collaboration might have an impact on advancement of PSTs' engagement. Therefore, instructors should consider which type of tools best match with the desired learning outcomes. Interactions and discussions might be delivered through asynchronous technologies in case an instructor would like to give students time to think, contribute, and reflect. Synchronous tools, on the other hand, might be more helpful for activities in which students feel comfortable sharing their ideas immediately.

Social media platforms have potential for creating supportive learning communities because interactions with peers and instructors by using social media may allow students to get to know each other better. This review also suggests that there are a variety of activities PSTs should practice through online tools such as reflection, observation, design, planning, engagement, and assessment activities. More variety of activities PSTs involve thorough collaborative virtual tools might result in more comfortability of using tools to collaborate with others and engage with content, peers, and instructor. Each of these practices are critical for promoting students' professional growth as future teachers. As educators begin to understand the potential applications of online technologies for collaborative teaching and learning, the role of teacher educators in implementing online tools becomes essential in addressing students' learning needs across disciplines. It is expected that this study has potential to encourage faculty members and instructors as well as colleges and university policymakers to consider the use of online tools supporting collaboration asynchronously, synchronously, and via social media, as an effective and efficient way to support teaching and learning.

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## KEY TERMS AND DEFINITIONS

**Active Learning:** An instructional method that enabling students take active roles in the learning process.

**Asynchronous Collaboration:** A type of collaboration in which the exchange of ideas/knowledge and interaction among users occur as schedules permit rather than connecting both the sender and receiver in real time.

**Collaborative Learning:** An educational strategy that involves groups of learners working together to create a product, complete a task, or solve a problem.

**Online Collaboration:** A technology-enhanced activity that allows a group of learners to work together to achieve a shared learning goal.

**Social Networking:** A practice of establishing online communities by making connections through social media sites.

**Synchronous Collaboration:** A type of collaboration in which the exchange of ideas/knowledge and interaction among users occur in real time.

**Web 2 Technologies:** A collective term used to describe a variety of web-based technologies for creating/sharing information, communication, and collaboration.

# Chapter 17
# Strategies for Engaging Students in the Online Environment

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## ABSTRACT

*Creating an engaging course environment requires a conscious effort from faculty to utilize course design, teaching methods, and instructional technologies that foster high levels of student interaction. Instructional technologies paired with effective pedagogies are making student engagement in online environments rich and meaningful. The use of instructional technologies is linked to student engagement in the online learning environment. Utilization of instructional technologies should address three major types of interaction: student interaction with course content, the faculty, and their learning peers. The use of instructional technologies to engage students can also increase students' motivation for their learning by increasing student value for course content. This chapter addresses specific strategies for utilization of course design, pedagogies, and instructional technologies to incorporate student interaction and develop and maintain students' motivation in their learning.*

## INTRODUCTION

A course should be an engaging experience where students participate in meaningful interaction and are motivated to learn. A conscious effort from faculty is required to support student interaction through appropriate pairing of technologies and teaching practice. This is challenging in any course; yet, the online environment may require a more deliberate effort. Fortunately for faculty, this is an exciting age in online education, as today's instructional technologies are able to engage students in rich and meaningful ways, especially when they are utilized to address student interaction and motivation.

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Utilization of instructional technologies and pedagogies should support three major types of student interaction, which are required for optimal engagement: Student interaction with course content, with the faculty, and with other students (Moore, 1989). In addition, motivation plays a critical role in how engaged students are in their learning, by addressing intrinsic and extrinsic factors contributing to student value for course content (Wigfield & Eccles, 2000).

This chapter provides a historical perspective for student engagement in online learning, and addresses engagement as a result of student interaction and motivation. The chapter presents specific strategies for utilization of course design, pedagogies, and instructional technologies to engage online students. In addition, it provides specific examples of application of engagement strategies to demonstrate potential uses.

## BACKGROUND

Research throughout the years demonstrates a link between the use of specific teaching methods or technologies and student engagement in online learning environments. Engagement increases with online collaborative activities (Thurmond & Wambach, 2004) and with the use of Twitter to engage students in student-to-student interaction (Junco, Heiberger, & Loken, 2011). What these studies and the many others like them demonstrate is the endless possible combination of specific application of pedagogy or utilization of technologies to effect student engagement. What, then, has the greatest effect on student engagement?

The faculty are online education's greatest asset in promoting and fostering student engagement. Faculty connect effective and empowering pedagogies to their subject matter to engage students in their understanding of course material (Shulman, 1987). Faculty act as artists and craftsmen, placed at the center of the design, delivery, assessment, and refinement of curricula (Flynn, James, Mathien, Mitchell, & Whalen, 2017). Faculty are the principal players in education and are the single most important factor in student engagement through facilitation of student learning.

If faculty are responsible for designing a learning experience that engages students, it is important to recognize what an engaged online student looks like. Classic research tells faculty to look at actions of participation such as talking and thinking about course material, and what students do with and feel about course material (Vygotsky, 1978; Wenger, 1998). How is this possible in online environments? Online student engagement is said in a recent study to manifest in the caliber of student work and the extent students maintain interpersonal relationships with faculty and other students (Kahn, Everington, Kelm, Reid, & Watkins, 2017). Other benchmarks come from the National Survey of Student Engagement, which was originally developed in 1998 to study engagement across campuses and traditional classrooms (Our Origins and Potential, 2019), and has since been used by online learning researchers to investigate engagement in online courses. This survey defines five benchmarks of engagement: Level of academic challenge, active and collaborative learning, student-to-faculty interaction, enriching educational experience, and supportive campus environment. These works help provide ways to evaluate faculty pedagogical, course design, and technology decisions and their impact on online student engagement.

## STUDENT ENGAGEMENT IN ONLINE ENVIRONMENTS

### Historical Perspective on Online Student Engagement

Retention has been a central theme for historical views on online student engagement. In 2005, dropout rates for students in online courses were as high as 80% for some colleges (Beck & Greive, 2005). Five years later, the range opened to a wide 40% to 80% (Smith, 2010). However, looks toward massive open online courses (MOOCs) also see high attrition rates, with 90% of students exiting courses quickly after signing up (Kolowich, 2013; Parr, 2013; Ubell, 2019). Many critics attribute poor MOOC retention to lack of student engagement, as many are streamed lectures and only few offering interactivity (Hone & Said, 2016; Ubell, 2019). The same could be said for any online course lacking the appropriate interactivity needed to keep students engaged and motivated in their learning. More importantly, these findings are telling that student engagement may be necessary to simply keep students in courses.

In addition, there is long-standing skepticism about the quality of the educational experience in online environments. The majority of skepticism is due to a perceived lack of student interaction with the faculty and other students. Research demonstrates again and again that online students feel disconnected from their learning peers and the teaching faculty (Edmundson, 2012; Lapadat, 2007; Otter et al., 2013). Even recent views on online student engagement uphold a belief that online students have fewer avenues for engagement than their face-to-face peers (Meyer, 2014). Yet, technology is making possible engagement that online education of the past could only dream. Also, as faculty continue to translate sound pedagogical practices to the online environment, students' engagement in their learning is sure to climb. Beck and Greive (2005) identified long ago that faculty had a significant impact on retention, and a recent review of literature found that faculty are the most important factor for online student success (Kebritchi, Lipschuetz, & Santiague, 2017).

Online learning environments may even offer some advantages for students. Online learning has shown stronger student outcomes than solely face-to-face courses including higher scores, a wider range of student contribution, and greater detail in student discussions (Dell, Low, & Wilker, 2010; Kemp & Grieve, 2014; US Department of Education, 2010). It is important to underline that these outcomes are evidence of student engagement as identified by Vygotsky's (1978), Wenger's (1998), and Kahn et. al. (2017) above. It is possible that online learning environments offer students time to think more critically about course material, leading to a deeper understanding. Therefore, faculty teaching online should recognize that the modality does not, in itself, hinder learning, and can be enhanced by conscientious course design and utilization of pedagogy and technology.

Instructional technologies have come a long way. Some of the most influential tools for online learning include learning management systems, digital authoring systems, and MOOCs. Learning management systems allow faculty to organize and curate course material, assess student progress, and communicate with students. They also provide opportunities for students to communicate and collaborate with one another. Digital authoring systems stimulate engagement by encouraging students to interact with course material, often making learning feel more like a game. Modern authoring systems no longer require technical programming skills, but simply faculty imagination (Ubell, 2019). MOOCs are offered by more than 900 colleges and universities and recently hit 101 million learners (Ubell, 2019). While, on their own, MOOCs often prove less than engaging, creative integration of MOOCs into courses can maximize the benefit of this wide variety of instructional material. Faculty today have a buffet of technology options to incorporate in their online courses. Utilizing sound course design and pedagogical decisions for that incorporation is what makes a course truly engaging. Online education is a dynamic environment with a continuous interplay of instructors, learners, and course content. Faculty should consider online learning not as a series of tools, but as a practice of innovative teaching (Ubell, 2019).

## Faculty Role in Student Engagement

Engagement is malleable, with pedagogical interventions, learning designs, and student interaction its major variables (Monkaresi, Bosch, Calvo, & D'Mello, 2017). Pedagogical methods and instructional medium are separate constructs of instruction, method the "active ingredient" and medium the neutral carrier for both method and content (Bernard et al., 2004). Student engagement is influenced by the method, while any medium, if it is appropriately applied, can fulfill the conditions for quality instruction. It is through method that faculty make selections for course content and learning activities and create the environment in which students display engaged behaviors (Umbach & Wawrzynski, 2005).

A highly influencing teaching practice, active learning, plays a significant role in student engagement. While active learning is often referred to as a specific pedagogy, it is in fact a practice of using any, or multiple, pedagogies to engage students in their learning (Bonwell & Eison, 1991). It is not surprising, then, that engagement increases when instructors use active learning practices. Active learning pedagogies include concept mapping, problem-solving, discussions/debates, role-playing, simulations, case studies, observations, interviewing, reflection, and collaborative activities (Alkandari, 2012; Chiu, 2009; Goldberg & Ingram, 2011; Meyer, 2014; Witkowski & Cornell, 2015). The hallmark of all active learning pedagogies is that they engage students by providing context for course material and conceptualization through opportunities to apply acquired knowledge and skills. They also challenge students to address assumptions and understandings, in addition to adding authenticity to learning. The combining effect increases engagement through student perception of credibility and relevance (Eyler, 2018), which enhances student value for course material, and, in turn, increases motivation (Wigfield & Eccles, 2000).

## Considering Motivation in Student Engagement

Motivation is necessary for students to engage in learning activities (Schunk, 2016) and is the process of instigating and sustaining goal-directed behavior (Schunk, Meece, & Pintrich, 2014). Most learning is motivated, and motivation plays a critical role in affecting student behaviors during the learning process (Ambrose, Bridges, DiPietro, Lovett, & Norman, 2010; Schunk, 2016). For students to perceive new concepts as fruitful, their needs, goals, and expectations must be addressed (Pintrich, Marx, & Boyle, 1993). This is why most motivational theories position value at the core of their framework (Atkinson, 1957, 1964; Eccles et al., 1983; Wigfield & Eccles, 2000).

Value, the perceived importance of a task, is produced when students feel course material and tasks are interesting, are closely related to self-conceived identity, and are related to future goals (Eccles, 2005). For students to remain engaged in course tasks, they must enjoy and perceive a sense of satisfaction for accomplishing them (Cook & Artino, 2016; Schunk et al., 2014). They must also feel it is important to accomplish a task well (Eccles, 2005). Students develop a sense of value through combinations of these factors, which are potentially reinforcing to one another (Hidi & Renninger, 2006). Failure of faculty to address students' perceived value for course tasks can result in evading motivation (Ambrose et al., 2010). Active learning pedagogies possess positive contributing effects for student engagement by providing the means to address student motivation.

## Considering Student Interaction to Produce Engagement

The degree of interaction within a course strongly influences the student's, and faculty's, experience. Michael Moore (1989) first proposed three types of interaction, which are all required for an engaging course: Student-to-content, student-to-instructor, and student-to-student. The idea of interaction has forged a strong thread through historical educational literature. Student-to-faculty and student-to-student interaction are found within the *Seven Principles of Good Practice in Undergraduate Education* Chickering and Gamson published in 1987 and later suggested for application to online learning (Chickering & Ehrman, 1996). All three types of interaction are woven into major frameworks and policies for online learning since Moore's original conceptions (Garrison, Anderson, & Archer, 2000; Graham, Cagiltay, Lim, & Craner, 2001; Ragan, 1998). A framework specifically developed for effective online learning, the community of inquiry model includes three closely aligned "presences": Teaching presence, social presence, and cognitive presence. It is apparent that online courses transform into engaged learning environments, when student interaction is deliberately considered.

### Student Interaction with Course Content

Moore (1989) said that, in online courses, students interact first and foremost with the content. He stated that it is the course content that makes a course educational. Students interact with course content when they access course material, read text, use study guides, watch videos, manipulate and synthesize course information, and communicate content through activities and assignments (Lou, Bernard, & Abrami, 2006; Parker, 2013). Faculty facilitate student-to-content interaction through curation of course materials, course design to include layout and structure, and implementation of course tasks. Understanding how best to organize, represent, and adapt instruction is the basis of pedagogy (Shulman, 1987) and a major way faculty facilitate student-to-content interaction.

Clarity and consistency within course design and perceptions of reasonable load of course tasks help students remain motivated to interact with course content (Hara & Kling, 2000; Swan, 2002). Online students enter courses unfamiliar with course content as well as course navigation and operation, increasing their cognitive load (Sheridan, Kelly, & Bentz, 2012). This may account for the increased effect of course organization and reasonable load on satisfaction and motivation.

Course content has many forms: Textbooks, articles, open educational resources, MOOCs, or instructor-made materials. Faculty use their expertise to curate content which is appropriate for the course topic and level of students. Course content provides a base for knowledge, while learning takes place when content is placed in meaningful contexts (Weigel, 2002). Therefore, it is the careful presentation of faculty-curated content that can have a greater impact on student engagement. Course content should be organized to flow naturally between topics and exist in a context that is relatable, interesting, and authentic, in order to keep students motivated. Integration of sound course design, active learning strategies, and appropriate technologies play an important role in helping engage students with course content.

### Student Interaction with Faculty

While course content makes a course educational, faculty provide the teaching experience. Learning requires interaction with the faculty. It is through interaction with the faculty that students build connection and make course material meaningful to their learning (Parker, 2013). Faculty interact with their students indirectly through course design, and directly through instruction and learning support. These actions include clearly communicated learning objectives, instructions for course tasks, guidance of understanding, reinforcement of course materials, feedback on acquired knowledge and skills, and development of values. Contact with faculty positively relates to student perception and satisfaction in online courses (Swan, 2002), and can help maintain student motivation.

Once students have access to course content, what do faculty add to their learning? What is the purpose of faculty presence in a course? The answers to these questions are found in student-to-faculty interactions. Faculty are experts in their field, and, while they utilize their expertise to curate and organize information, they also bring life to course content. Student-to-faculty interaction is the art of teaching. Through this form of interaction, faculty ensure the course is presented as they intended and facilitate the learning process. While student-to-faculty interaction is delineated as a separate form of interaction among the three, all three types are faculty-driven (Parker, 2013).

### Student Interaction with Other Students

Learning is social, and much work has been done in the field of psychology to prove that learning occurs through interaction (Bandura, 1989; Dewey, 1910; Vygotsky, 1978). As the author mentioned earlier, a major concern of online learning is students' sense of disconnect. The presence of active and valued discussions among students in online courses leads to positive perceptions of online learning (Swan, 2002). Further, students are more motivated to learn course content, when they participate in collaborative activities (Witkowski & Cornell, 2015). These findings align with the idea of social presence or the perception that real people are behind online communications (Rourke, Anderson, Garrison & Archer, 2001). Therefore, it is important to build community in online courses. Participating in a learning community provides students the opportunity to engage each other in powerful dialogue.

The concept of online community has been a topic of research for many years and has developed a body of research (Meyer, 2014). In online learning environments, community is essential to tackle a sense of distance among students; Palloff and Pratt (2003) laid the groundwork on the topic. Social presence is considered fundamental to the creation of a community. Social presence is less socializing for socializing sake and more social interaction for the purpose of learning (Garrison, 2011). This is why it is important for faculty to understand that student-to-student interaction requires faculty facilitation. Faculty have a role in keeping online students focused on educational goals within their interactions. In fact, some students can perceive socialization as counterproductive to learning, when it is not focused on purposeful learning (Meyer, 2014). Faculty actions that foster online learning communities are modelling involvement, setting clear expectations for interaction (Flynn et al., 2017), and valuing student-to-student interaction through feedback and holding students accountable (Parker, 2013).

## SOLUTIONS AND RECOMMENDATIONS

The utilization of active learning pedagogies and instructional technologies are effective ways to engage and motivate students in the learning process. Today's technologies provide helpful solutions for faculty to address the challenge of transforming online students into tangibly engaged learners (Ubell, 2019) and engaging students in their online learning is challenging. First, reconceptualizing course information is difficult, especially highly technical content. Articulate (2018) surveyed 3,100 e-learning developers and 530 learners; half of the designers said making technical information engaging for learners is hard, and 40% of the learners said e-learning experiences are typically boring. The battle in transforming course content into engaging and interactive material is common. Second, engaging online students in student-to-faculty interactions requires a more deliberate approach than in face-to-face teaching. It can feel daunting to consider the time for interactive efforts and avenues through which to interact with students on a regular basis. Lastly, engaging students with one another may seem nearly impossible in the online environment. Faculty no longer can simply glance out to see student groups hard at work. This section presents generalized ideas for utilization of course design, active learning teaching methods, and technology in online courses, organized into each form of interaction and followed by specific examples for application.

## Facilitating Student-to-Content Interaction

### Course Design: Promoting Exploration

Many online courses follow a similar structure: They start with an introduction, follow with sections of content, and end with a final assessment. This linear structure locks student navigation throughout a course and pushes information to students (Articulate, 2018). This is appropriate when students are not expected to apply their knowledge. However, most college courses do expect student application of knowledge, so this structure offers no alignment with course design and expected student outcomes. The alternative is to unlock course navigation, allowing students to pull information as they engage with course tasks.

This plays to students' natural curiosity which is an essential part of the way human beings learn (Eyler, 2018). Instead of presenting course material in a linear fashion, faculty can consolidate information into infographics, interactive slides, diagrams, or metaphorical rooms that require students to click around and reveal additional information or entice deeper dives into course material (Articulate, 2018). This consolidates up-front information, and gives students control over what they discover next and at what pace. This change makes overall course layout an important consideration. Common layouts include courses divided into modules, many organized by date, guiding student progression through course content, week by week. However, alternative module organizations are possible. Modules which are organized by topic guide students, instead, through important course concepts, providing overall context to a particular field of study. Modules which are organized into pros and cons, or contrasting views, on course concepts give students perspective to the conversations within a field. More excitingly, modules representing metaphors, such as rooms, playground equipment, and animals, provide easier to understand contexts to make clear specific course tasks, while fostering exploration.

Example: In an undergraduate interprofessional education course taken by healthcare professional students and titled *Interprofessional Healthcare Exploration*, course content was organized into modules representing major course issues delivered in three virtual course rooms: A reflection nook, a learning lab, and a group meeting room. Each module included any of the three rooms, based on the tasks the learners were required to complete for each module.

For example, in the module *Exploring the ME in Interprofessionalism*, student completion was marked by submission of a journal entry reflecting on their specific professional role in patient care. In order to complete this task, students were required to visit the Learning Lab, which contained course material about the importance of understanding one's own role in interprofessional practice. Course materials consisted of brief text developed by the faculty, link to a pertinent article, an embedded faculty-created video explaining concepts, and a case study describing a patient in need of healthcare. Students were also required to visit the Reflection Nook, where they used the journal tool to submit a personal reflection on their professional role specific to the patient in the case study.

Within this module, student-to-content interaction was addressed through utilization of course design promoting exploration of course material to apply to a task, the active learning pedagogies of case studies and reflection, and careful use of technologies found within the existing LMS. By centering the module on completion of a personal reflection, module organization was unlocked, allowing students to reenter rooms until they were ready to reflect. The rooms provided a framework that guided students through module tasks, making clear the areas of information pulling and application of knowledge.

## Active Learning Strategy: Case Studies

Course content is meaningful to students if it is relevant to their experience, future goals, and interests. Asking students to solve problems they may actually face in their future increases motivation by providing cognitive authenticity, rather than abstract concepts (Elyer, 2018). Authentic situations effectively demonstrate to students why course content is important. In addition, asking students to consider or solve a case or problem places them in the situation to pull course content as they need it, instead of pushing content at the student. When course content is meaningful, students are engaged and motivated in their learning.

Example: Returning to the *Interprofessional Healthcare Explorations* course, faculty-developed cases were included to present complex issues seen in modern healthcare, such as a cancer patient requiring treatment only offered in a larger city or a homeless patient with no health insurance. Students had to pull course material until they felt prepared to tackle each unique patient problem. Patient problems required students to understand how various professionals contribute to patient care and how multiple professionals realistically communicate to effectively provide all needed care and services for the patient. Each case provided an authentic view of patient issues professional students likely will face in their future practice.

Assessing Case Studies: When assessing student learning from case studies, it is important to focus on aligned learning objective(s) and level of student learning desired. Case studies require students to apply course material to situations, often to accurately evaluate presented problems and develop solutions. Therefore, students should be assessed at the appropriate taxonomy level (i.e. application, analysis, evaluation, and create) (Anderson, Krathwohl, & Bloom, 2001).

In the example above, students were assessed for their ability to accurately develop a care team consisting of eight healthcare professionals able to care for the patient's specific needs. To achieve this, students must be able to accurately identify appropriate professionals and understand each professional's role and scope of practice. Therefore, these lower-level abilities do not need to be assessed as they are needed to perform the higher-order objective.

## Active Learning Strategy: Reflection

Reflection, a metacognitive activity, transforms experience into purposeful and meaningful learning (Kolb, 1984), and transforms learners' points of view by challenging perspective (Meizrow, 1998) and questioning value (Bolton, 2014). Providing students with deliberate opportunities to reflect has positive effects on student engagement in their learning (Ribeiro et al., 2019).

Example: The creation of a course room, the Reflection Nook, made students aware that reflection played a significant role in the course. Entire assignments centered on reflective opportunities, reflecting on one's own role, or reflecting on what students had learned from a particular assignment. Through reflective submissions, faculty were able to assess student expectations, student understanding, and what students were gaining from certain assignments. Reflective information provided opportunities for faculty to address misunderstandings and challenge student perceptions.

Assessing Reflections: The learning goals associated with reflections can cover a wide variety of taxonomies. Reflections can be utilized to guide students to analyze course content or their own values and beliefs or to foster critical and creative thinking. In the example provided, students were assessed primarily on completion of reflection to all reflective prompts, as the reflections were primarily used to provide students a space to practice reflection and for faculty to gather formative information about student understandings and perceptions.

## What Students Say About Reflections

*I think what helped me most in this class was all the reflections that I had to do. When I had to learn about new professions and even professions that I work with daily, I then got time to think about what role they truly have within the team and it gave me better perspective.*

*Taking time to reflect helped me to pull together and reevaluate the things covered in the course and how it helped me to better my own skills regarding working with an interdisciplinary team.*

*Reflecting helped me to value this course because it placed things into perspective and actually think about what was covered, and not just focus on filling the requirements for a grade."*

*I was glad that the reflections were more than simply stating how we feel about things. By tying reflections into more specific questions, I believe thoughts become more meaningful.*

## Course Design: Repetition

Too often, students are provided only one opportunity to practice applying course material. Faculty rarely provide the opportunity for students to revise their work and try again. It is well known from the work of German psychologist Hermann Ebbinghaus (1885) that repeated retrieval of information improves learning, but it is also true that repeated opportunities to apply information have substantial impact on learning (Karpicke & Roediger, 2008). In addition, providing students multiple opportunities to attempt course tasks engages them through the promotion of a growth mindset (Dweck, 2007).

Example: Returning to the interprofessional education course, while all course tasks were assigned a due date, all allowed multiple submissions. Students were encouraged to work as fast as they liked, motivated by the opportunity to revise and resubmit work with faculty feedback. Faculty set aside one hour each day to review submissions, provide feedback, and request a revision. Students had until the due date to make as many attempts as needed to achieve a quality submission. Students routinely commented on the ability to revise and resubmit as a positive attribute of the course, and the majority of students utilized multiple opportunities to submit work.

### What Students Say About Repetition of Course Tasks

*I absolutely loved the opportunity to revise my work. I tend to learn best from my mistakes and from feedback. This opportunity was another way I utilized teamwork with not just my team, but with my instructor. The opportunity to revise work is a realistic component to the course, because there is usually continual feedback and revising when creating a patient's plan of care.*

*One benefit I feel strongly contributed to our grades was instructor feedback. I found it very beneficial to submit an assignment early to receive feedback and have the opportunity to revise it. Not only did this benefit our grade, but for myself it made me see where my mistakes were, and I had the opportunity to learn from them. I wish more of my classes offered this opportunity.*

*Receiving instructor feedback and being able to revise work was "refreshing". I believe that one of the best ways to learn is when we can rethink mistakes and learn by figuring out how to do things better. I truly enjoyed receiving specific feedback, partially to learn from it, however, also because it felt like what we wrote actually mattered. I have had classes where I was not entirely sure if anyone actually read what I wrote, making it appear futile to put high amounts of effort into assignments, because I would never know if my answers were on the right track.*

### Active Learning and Technology: Games

Course content can be turned into learning games by creating an experience where students make decisions in an effort to work towards a specific outcome. By combining the benefits of case study and reflection utilization, games can challenge students' understanding and provide context and real-world application for course content. Conceptualizing a game begins with learning objectives. What are faculty hoping students can do as a result of their course? Faculty should break the course into smaller mini-curriculums, each with its own challenge, building to the larger problem. Games should guide students through multiple decision-making activities, such as a series of puzzles or problems to solve (Articulate, 2018). Student actions within the game should result in consequences: Progression forward, dropping back to last point, or even branching to a new problem. Games engage students through fostering exploration, taking risks, providing authentic situations to apply their learning, and challenging students' understanding.

Faculty can use games as an opportunity to tell a story. Games should involve emotional aspects displayed through characters. Humans are hardwired to respond to emotion, making this a strong engagement tool (Mayer, 2009). Even when students have little experience with course material, stories provide a way to connect with the material via emotion.

Example: Students enter a game from the perspective of the patient, in need of care. As students progress through the game, they encounter different healthcare professionals. Each professional can share his/her role and scope of practice, and the student will decide if he/she is the appropriate provider for their specific needs. Consequences could include incorrect care given, setting the patient back or making them worse, and extra charges on the patient bill, as the patient's insurance will not cover unwarranted care.

### Maintaining Focus on Content

With so many ideas to transform course material into engaging content, it may feel as though the content itself could get lost. Especially when a course historically delivers large quantities of information (i.e., gateway courses leading to more specialized courses), faculty will want to ensure that content remains in the course. There are ways to address engagement, using techniques such as the ones the author mentioned earlier, without compromising content.

Students can explore course content during information-rich areas: Moments built into cases, games, or prior to reflections. These can be informative moments during a game or course content located outside the case. Students can explore content in a course library, after reading a case or before preparing a reflection. Students can also be sent on a quest to discover information themselves. Games can provide brief backgrounds at the beginning of a new stage, or virtual guides can present information. Game characters can represent course material in their back story, shared as students interact with them. In addition, faculty can share course material during feedback opportunities, using material to justify why a student got something right or wrong. In addition, courses can be semi-locked by creating points where students are not allowed to move forward without demonstrating their understanding. In fact, a mixture of these techniques can be used to ensure all course content remains in the course.

## Facilitating Student-to-Faculty Interaction

### Course Design: Layering Interactions

While most online courses come with their fair share of student emails, there are many forms of meaningful student-to-faculty interaction. It is helpful to think of student-to-faculty interaction in layers. The first layer consists of blanket interactions, that is communications that can be built into a course and are communicated to all students. Blanket interactions include the syllabus, learning objectives, instructions for learning modules and individual activities, and weekly course announcements. In blanket interactions all students receive the same information at the same time. Blanket interactions are important for setting the tone of a course. They determine if students perceive a course as a friendly and welcoming space, and if they find faculty approachable. In addition, the construction of blanket interactions can control, to some degree, how frequently students feel they need to reach out to faculty for individual inquiry. Clear instructions and regular announcements help keep students on track and prevent them from getting confused, by focusing their efforts week to week. Blanket interactions should be considered during the design phase of a course. Once a course is deployed, this type of interaction has no additional workload for the faculty.

### What Students Say About Clear Blanket Statements

*The instructions were clear and explicitly explained in the syllabus, and assignments were graded promptly.*

*The instructor provided clear and concise instructions to ensure the student's success in the course.*

Once a course is open, it is important faculty customize interactions to the specific group of students in each section of a course (custom interactions). Students feel connected to faculty that demonstrate interest in them through frequent and prompt communication (Beck & Grieve, 2005; Hara & King, 2000). Custom interactions include specific course announcements and broad feedback on course activities. Through custom announcements, faculty address how a class, as a whole, is performing. Similarly, feedback composed to be similar for all students can explain broad concepts and common misunderstandings for revision opportunities. This type of interaction requires faculty to dip into the course weekly and see how students are progressing. These interactions communicate to all students faculty's expectations for their work and where faculty feel they are, as a class, in comparison. Custom interactions create a sense of teaching presence in a course, demonstrating to students that faculty are regularly looking at progression and are interested in their success. Custom interactions can build relationships with students, when faculty add praise, humor, and personal experiences to announcements or feedback to build a sense of immediacy (Gorhan, 1988). In addition, custom interactions help develop a sense of a community of learners through the demonstration of value on what students are contributing and purposeful mentioning of the variety of backgrounds represented in the submissions being reviewed. Lastly, as blanket interactions, this type of interaction can impact the frequency students feel they need to reach out to faculty individually, minimizing faculty workload.

The last, and most personal, layer of interaction is individualized interaction. This is utilized to interact with students on an individual level through emailing, providing specific final feedback on course activities, and providing guidance for individual students that are falling behind. Individualized interactions are between faculty and one student only. Faculty should add individualized interactions to customize review of student work for individualized feedback for student's strengths and weaknesses. This is especially important when reviewing work for a final grade. Faculty should set realistic expectations by communicating at the start of a course the student wait time when emailing faculty (i.e., 24 hrs). Individualized interactions are important for reaching out and offering support to individual students, especially those who may be falling behind in submissions. In this way, these interactions catch problems at the head, before students get too far behind. With a well-constructed plan for blanket and custom interactions, individualized interactions are kept to a minimum, helping faculty provide a deep level of individualized interaction to those students that need it most.

Language and tone are important considerations for communications, such as email, course announcements, and feedback during student-to-instructor interaction. Tone is the primary means of expression, when facial ques are absent. It is important to write with a positive tone, while also communicating the message. Communications should not be too long, but concise, increasing the chances students read the entire message. All feedback, positive and negative, should mention at least one example of what a student did well, in addition to specific references for what students need to focus effort on for improvement. Students desire unambiguous feedback (Hara & Kling, 2000), and they surely cannot revise when messages read "needs work" or "great job".

## What Students Say About Individualized Interactions

*The instructors were very engaged and willing to help as much as they could. Additionally, their feedback was helpful and helped me to reflect back and improve on myself!*

*It was great having an instructor who provided positive feedback and responded back in a timely manner with any questions we had regarding the assignments.*

*I really appreciated the opportunity to receive feedback from our instructor and revise our work! In an online course it can be difficult to really know what an instructor wants to see in an assignment, and I think my performance in this course was greatly improved by hearing from the instructors on how I was doing and where I needed to improve.*

*Instructor feedback was very helpful during this course because it gave me another view on my work and helped me further my thought process on different assignments. The input always pushed my understanding of the situation. It also gave me further explanations about certain topics which I did not fully understand.*

## Technology: Faculty Videos

While once costly and time-consuming, creation of high-quality videos is now attainable to any faculty with a smartphone and broad knowledge of available technologies. Creating videos for course announcements allow students to see faculty and bring back important facial ques, such as smiling, eyebrow rising, and head tilting, that create a sense of immediacy (Gorhan, 1988). Video announcements do not require professional polishing. Students react positively to videos recorded on webcams or phones, as long as the video feels like a natural conversation (Articulate, 2018). This feels authentic to students. Faculty videos can be uploaded to YouTube and incorporated into learning management systems. VoiceThread is a popular and fairly low-cost technology which is used to create video, or audio only, course announcements, and integrates with most learning management systems.

Screencasts are another form of faculty-made videos that are useful for providing instruction for processes or demonstrating course navigation. Screencasts offer visual demonstration for how to accomplish a task, while also incorporating audio of faculty explanations. Jing, a popular screencast software, can be installed on any computer for free and provides screencasting capabilities for videos up to five minutes in length. Also, Jing can be used to capture still screen shots, which can be saved and included in course presentations or communications like any other image. Other screencasting technologies include Replay, Snagit, and Camtasia, all at reasonable cost. Adding icons imbedded in an instructional video for students to pause or read additional information can make videos an engaging method for connecting with course content. This also gives students control over when they want to pull course information.

Example: In the interprofessional education course, all weekly announcements were faculty-created videos of two to three minutes in length. These weekly videos addressed faculty's broad impressions of submitted work from the previous week and provided focus for upcoming tasks. Faculty added personal antidotes related to course topics, and demonstrated value in the variety of backgrounds which students represented. Faculty captured videos on personal cellphones or webcams, posted them to YouTube, and integrated them into the learning management system. Students enjoyed the personal presence of faculty in the course and often commented in course evaluations their appreciation.

### What Students Say About Video Announcements

*I liked the weekly video updates, so you could actually see who was teaching you and hear from them on a weekly basis.*

*I found the weekly update videos helpful and it was nice to have some "face time" with an online class.*

*I found the videos on Mondays very helpful to get the weeks assignments started.*

*The weekly videos for the assignments was great and helped the students put a face with a voice and/or name.*

### Active Teaching Strategy: Faculty Participation

Students respond positively when faculty participate in course activities. Faculty can participate by posting threads in a discussion, contributing to course wikis, and contributing personal submissions to written assignments or journal reflections. This demonstrates to students that faculty value the activity enough to contribute personal effort. It is also an excellent way to provide examples of the caliber of work faculty expect. Most importantly, it establishes a community of learners, as students feel faculty are an integral part of the learning process.

## Facilitating Student-to-Student Interaction

### Active Learning Strategy: Discussions

Discussions have a long history in online education, and are often used to promote discourse among online students. Literature presents online discussions as more productive than face-to-face discussions, making the case that students who are reluctant to speak in traditional classrooms often participate more, resulting in more diverse perspectives shared (Gay, 2010). In addition, the asynchronous timing of online discussions may allow students to take time to read, reflect, and provide deeper responses (Rowe, 1986). Online discussions are not simply discussion boards, but can be focus groups, brainstorming sessions, group blogging, collaborative analysis of case studies, group wikis, and collaborative exams (Meyer, 2012). Faculty who want to increase engagement through online discussions need to view discussions as a flexible tool that can achieve many learning objectives (Meyer, 2014). Free technologies such as VoiceThread and Flipgrid can provide students a way to discuss course topics by way of video. Students record their ideas and responses to discussions asynchronously and post to the discussion forum. Students then feel high levels of social presence through watching other students' videos.

How faculty prompt discussions is important. Asking the right questions and providing clear goals for the discussion can set a discussion up for success. In addition, faculty need to consider the goal of the discussion: Solving a problem, discussing pros and cons, developing a stance supported by research, evaluation of a case study, or development of a creative innovation. The level of the triggering question that initiated the discussion and the goal of the discussion largely influence the Bloom's (1956) taxonomy level of student responses (Meyer, 2005; Richardson & Ice, 2010). As the author mentioned many times, pedagogy impacts learning.

Assessing Discussions: Like any teaching strategy, assessing discussions requires alignment with learning objectives and expected outcomes from the discussion. Most importantly, faculty should consider discussions as more than a tool for interaction, but a method by which students can assess and evaluate perspectives, problem-solve, troubleshoot, and even create through collaboration. Discussions have huge potential, if prompted well. For example, discussion contributions can be assessed to determine if students are able to engage in evidence-based debate when prompted with an ethical situation with no clear resolution. Also, discussions can be assessed for collaborative creativity when students are prompted to solve a complex problem with boundaries preventing them from using common solutions.

## Active Learning Strategy: Collaboration

Many learning management systems integrate collaborative tools for student use. Wikis, blogs, and conferencing tools provide mechanisms for collaboration. Wikis align best with activities where students contribute individual ideas towards a collaborative product. Wikis allow students to collaborate on text, images, and embedded videos. Blogs, while often utilized as an individual activity, can be utilized as a collaborative assignment. Blogs work well for group consensus and shared perspective activities. Free conferencing tools such as Blackboard Collaborate, Zoom, Skype, Google Hangouts, and Facebook Live provide platforms for group brainstorming and collaborative planning. Student groups should be allowed to decide which platform they will use, but faculty are responsible for holding groups accountable.

One of the most important aspects of collaborative assignments is not assuming students know how to collaborate. Many faculty shy away from including group activities in their courses, after experiencing past failed attempts. Structure is very important for successful student group work. One powerful structuring technique is to make the first group activity the formation of a group contract. In a group contract, the role of each group member, the mode of communication, expected frequency of communication, and consequences for members that fail to contribute are all established. Once groups collaborate on the formation of a group contract, the accountability among members is high and faculty rarely are required to intervene throughout the collaborative process. Another structuring technique is to provide templates for collaborative products. Outlines or tables for students to "plug in" required components of an activity are very helpful for students to conceptualize layout and parts of larger projects. In addition, this often makes reviewing and grading collaborative products easier.

Example: In the interprofessional education course, groups were formed by placing students from a variety of professional programs of study in an interprofessional team. Groups were given a case study and assigned a wiki, on which they were asked to embed a concept map of professional interactions and develop a narrative telling a story about the patient's care. Students were required to build a team of healthcare professionals to care for the patient and address major healthcare-related needs. They were also required to represent themselves as members of that team. The wiki was prepopulated with a table allowing students to contribute their own role in caring for the patient, a link to free concept mapping software (Creately and bubbl.us), an area to embed the final product, and an area for the collaborative narrative. Groups were formed in week 3 of the course and given access to their group wiki. Final wikis were due in week 8 of the course, giving students five weeks to collaborate. Faculty entered group wikis each week and provided feedback to each section, keeping groups on track.

When it comes to student-to-student interaction, the limit is only faculty imagination. Faculty have an important role in facilitating student collaboration. These actions include keeping student-to-student interaction focused on learning and providing structure for collaborative efforts.

### What Students Say About Structured Group Work

*I previously had a negative experience dealing with group assignments in another online class, and this class has changed my views on that. The instructor was very helpful and organized and provided great feedback on assignments!!!!*

*I liked seeing all the students in the class put their input in with each assignment. It was interesting to see the differences and similarities we came up with.*

*I learned a lot from hearing other members of the groups opinion and roles.*

*By working with an interprofessional team, I was able to learn about other fields and to expand the care I delivered. Other team members add to my personal knowledge and give better care to patients. This class has shown me how communicating and asking questions helps you learn.*

## FUTURE RESEARCH DIRECTIONS

As more faculty become familiar with utilizing course design, teaching methods, and technologies to interact with and motivate students in the online learning environment, online education will blossom. As online learning demonstrates higher levels of student engagement, higher education could flip in a broad sense with the majority of course content offered in online formats and classroom time reserved for application of skills, preceptorships, mentoring, and shadowing opportunities. This shift can be facilitated by focusing on developing faculty in successful online teaching strategies, either during onboarding or during transition from face-to-face to online course. Future research in the area of faculty development on best methods for fostering and supporting online teaching skills is essential. In addition, research on the best methods to support distance faculty, and/or adjunct or part-time faculty teaching in online environments is needed.

## CONCLUSION

Creating an engaging course environment requires a conscious effort from faculty in utilizing course design, teaching methods, and technologies that foster high levels of interaction for students. Online courses should address three major types of interaction, that is student interaction with course content, the faculty, and other students, as well as student motivation for their learning. Designing courses to promote student exploration of course material and repeated exposure to course activities increases engagement and motivation. Active learning strategies such as case studies and reflections provide authentic contexts for course content and opportunities to challenge understandings. Using technology to foster student-to-faculty and student-to-student interaction engages students in collaborative learning and motivate students through feedback and important faculty communication. Layering interactions with students relieves faculty workload and allows faculty to focus on deeper connections with students. All three interactions are faculty-driven and provide teaching presence that keeps students engaged and motivated.

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## KEY TERMS AND DEFINITIONS

**Engagement:** Sustained connectedness within a course through actions such as thinking, feeling, applying, and creating.

**Facilitation:** Presence of the faculty in guiding and supporting the learning process.

**Instructional Technology:** Technologies used to instruct students, often providing interactivity with course material and opportunities to apply knowledge and skills.

**Interaction:** Connecting with content, faculty, and other students through communication and collaboration.

**Motivation:** The ability to maintain behaviors that drive an individual towards achievement of goals.

**Online Environment:** A virtual learning experience where individuals who are involved in the learning are not located physically close to one another, but can be located at any distance from one another, and interact with learning platforms to share information and apply knowledge and skills for learning assessment.

**Preceptorship:** A learning experience where students learn alongside a professional performing tasks and using theories commonly utilized in that particular field of work.

**Value:** A feeling that course material and tasks are important to one's future goals, self of identity, and interests.

# Chapter 18
# Game-Based Learning in an Online Environment:
## Effects on Student Engagement

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## ABSTRACT

*A game-based learning team exercise was specifically designed as a teaching tool which aimed to unlock the black box of cultivating student engagement in an online learning environment. In the exercise, online distance learning students were divided into police and prisoner groups whereby they were required to use different resources for catching the prisoners or for escaping from the police on a virtual map. The team exercise helped to create an innovative online learning environment that was active, cooperative, and encouraged student engagement, these being some of the key elements to enhance the quality of student experience. To evaluate the effectiveness of this exercise, an experiment was conducted using survey data from undergraduate students in an online learning environment. Results showed that the online class with a team-based activity had significantly higher scores in students' behavioral engagement than the other online class without a team-based activity while the differences in cognitive and emotional engagements were not significant.*

## INTRODUCTION

As many students have grown up with technology nowadays, it is second nature for them. Higher Education must take advantage of knowledge and use it to address students' educational needs. The advancement in Internet technologies has provided new opportunities for computer-supported collaborative learning activities in online environments. The Internet and related technologies enable learning anywhere and

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anytime, and present flexible and innovative channels for interaction (Burgstahler, 2000; Chickering & Ehrmann, 1996). For instance, instructors and students can collaborate virtually via computer networks (Hwang et al., 2012; Neo, 2003; Wang, 2010; Verdu et al., 2012). A simple online learning environment usually allows the instructor to generate and share contents, and provides a platform that facilitates the learner to interact with peers and the instructor on the contents (Nguyen et al., 2016). This enables and enhances learner-content, learner-instructor, and learner-learner interactions (Tawfik et al., 2017).

In collaborative learning environments, students work in groups to achieve learning outcomes together. When such environments are made available online, students can benefit from more interaction and participation with peers (Hrastinski, 2009; Morris et al., 2005). Studies show that a well-designed online course can further make the learning environment more engaging while allowing students to acquire high-order knowledge and problem solving skills (Gee, 2003, 2009; van Eck, 2007). This is because good online learning contents will involve students in an iterative problem-based learning process, through which they have to make decisions on embedded inquiries, experiment with solutions or strategies, and reflect on those strategies so as to develop new understandings or skills (Garris et al., 2002; Kiili, 2007).

With the 21st century concept of teaching in a Digital Age, Higher Education must evolve with the new era and adapt curricula to the present market needs and it is here that teaching methodologies must ensure that students are provided with the tools required to acquire those competencies demanded by the growth of a knowledge society (Aznar et al., 2017). Despite the advantages of using technology in an online learning environment, engaging online students remains a challenge to many academics. This may seem to be even more apparent when effective teaching involves skills such as teamwork, creativity and problem-solving. Game-based learning may help to enhance the skills since gamified activities can provide particular learning experiences where students are immersed in complex tasks in which these skills can be acquired and developed. In other words, game-based learning is able to draw connections between coursework and real-life and students are able to develop better critical thinking skills and thought processes around course concepts (Williamson & Sandford, 2011).

Game-based learning is not an entirely new concept and has been growing in the last decade or so in education (See e.g., Crocco, Offenholley & Hernandez, 2016; Manuel, Wolfgang, & Johannes, 2011). In a game-based learning environment, students learn new concepts and practise skills in a risk-free setting while their progress in a gamified activity is directly related to their understanding of the subject being taught (Hamari et al., 2016; Hwang, Hsu, Lai & Hsueh, 2017; Kiili, Moeller & Ninaus, 2018). Game-based learning helps to increase student engagement by fostering enthusiasm for a topic and allowing students to gain a better understanding of course materials in an enjoyable and interactive way (Hung, 2018; Williamson & Sandford, 2011). It gives students a customised learning experience in which students are afforded the opportunity to make mistakes in a risk-free environment, correct those mistakes and revisit course content (Manuel, Wolfgang & Johannes, 2011). A well-designed game-based learning experience, along with well-implemented learning tasks, has several advantages such as students being more engaged and motivated over traditional teaching methods and thus it is likely to assist students to acquire, for example, teamwork, creativity and problem-solving skills.

Game-based learning is one of the emerging instructional technologies most likely to be adopted in online Higher Education in the coming years (Crocco, Offenholley & Hernandez, 2016). As Gagne (2013: 7) has argued, 'instructional technology includes practical techniques of instructional delivery that systematically aim for effective learning, whether or not they involve the use of media.' Thus, the decision of applying game-based learning, especially in an online learning environment, requires careful consideration as the impact of the approach in a non-traditional virtual setting remains unclear. Using a gamified activity in online courses does not guarantee a deep learning outcome. If a gamified activity is used inappropriately without alignment to students' educational needs for constructive learning, it may make students feel unmotivated, not engaged and even lead to high student dropout rate. To date, very little systematic research has been conducted to understand the impact and best practice of game-based learning on online distance learning students at the Higher Education level. In other words, the black box of utilising game-based learning to cultivate student engagement in an online learning environment needs to be unlocked. This chapter aims to fill this gap by seeking to empirically understand the effects of an online team exercise on student engagement in online learning and to provide critical design considerations for game-based learning in online Higher Education courses.

## BACKGROUND

Student engagement can be defined as "the time and energy students devote to educationally sound activities inside and outside of the classroom, and the policies and practices that institutions use to induce students to take part in these activities" (Kuh, 2003: 25). Engagement encompasses both emotional and behavioural components (Skinner & Belmont, 1993). Engaged students usually direct and sustain their behavioural efforts in initiating and carrying out learning activities accompanied by positive emotions, including enthusiasm, curiosity, optimism and interest (Connell & Wellborn, 1991; Lund Dean & Jolly, 2012; Skinner, 1991). More recently, other scholars have suggested a three-component model of engagement by including a cognitive dimension, for example, self-regulation and learning strategies (Archaumbault, 2009; Fredricks et al., 2004; Fredricks & McColskey, 2012; Jimerson et al., 2003; Wigfield et al., 2008).

Emotional engagement refers to affective responses to learning activities and to the people involved in those activities (Appleton, Christenson, & Furlong, 2008). Previous studies showed that positive emotional engagement was found to create students' ties to the schools and influence their willingness to do the work (Connell & Wellborn, 1991; Finn, 1989). Moreover, students who are more emotionally engaged in learning are more likely to experience greater psychological wellbeing (Carter et al. 2007; van Ryzin et al. 2009).

Behavioural engagement draws on the concept of active participation in school, lessons and classroom activities (e.g., Appleton et al., 2006; Fredricks et al., 2011). However, the concept can be applied at the Higher Education level. It includes involvement in academic, social, or extracurricular activities considered crucial for achieving positive academic outcomes (Connell & Wellborn, 1991; Finn, 1989). Students who score more highly in behavioural engagement tend to demonstrate positive conduct, such as following the rules, paying attention in class, attendance (or active participation in online class), assignment completion, showing persistent task-focused behaviours and effort, and absence of misbehaviour in Higher Education (Finn, Pannozzo, & Voelkl, 1995; Finn & Rock, 1997; Putwain et al., 2018).

Cognitive engagement is defined as a student's level of investment in learning. Active cognitive engagement shows students' reported use of meta-cognitive and self-regulation strategies rather than of help-seeking or effort-avoidant strategies. It includes being thoughtful, strategic, and willing to exert the necessary effort for comprehension of complex ideas or mastery of difficult skills (Corno & Mandinach, 1983; Fredricks et al., 2004; Meece, Blumenfeld, & Hoyle, 1988). Students who score more highly in cognitive engagement would regulate attention and effort, relate new information to existing knowledge, and actively monitor comprehension (Corno & Mandinach, 1983; Weinstein & Mayer, 1986).

## A KNOWLEDGE MANAGEMENT PERSPECTIVE OF GAME-BASED LEARNING TEAM EXERCISE IN ONLINE ENVIRONMENT

In today's highly complex world, knowledge management and organisational learning has been the 'hot topic' as leaders and managers seek to enhance organisational performance through innovation (Donate & Sánchez de Pablo, 2015). There has been a growing and fundamental shift in the way the world operates; organisations are no longer merely shaped by the economic environment, but are shaping that environment (Lombardi, 2019). This is a dynamic and global phenomenon that has impacted on all sectors since the 1990s, whether they be private, public or not-for-profit. The impact of a knowledge-based economy orientation and its concomitant relationship to organisations is still growing and the world is still waiting to feel the full impact of its arrival and influence (Torres, Ferraz & Santos-Rodrigues, 2018). Academics and lecturers in knowledge management and organisational learning must ensure that their students have the advanced knowledge and skills required to managing knowledge and learning for innovation in their organisations. Students need to learn, understand and apply the relationships between knowledge purposes, knowledge processes and managing knowledge and learning for value-creation from inter- and intra-organisational levels and the ways that the two levels are connected (Kong, Chadee & Raman, 2013). While learning and understanding from the textbooks or case study is essential, these methods may not be the best approach in terms of engaging online distance learning students. As already mentioned, engaging online students, especially when effective teaching involves people management skills such as teamwork, creativity and problem-solving, seem to be particularly challenging. Thus, there is an urgent need to ensure that online courses are delivered to help online distance learning students to acquire and develop these specific people management skills, and assist them to draw connections between coursework and real-life scenarios for enriching their learning experience (Williamson & Sandford, 2011). Game-based learning likely helps to address this urgent need.

As already mentioned, game-based learning has been growing in popularity (Hamari et al., 2016). However, how a gamified activity is designed and aligned to students' educational needs for constructive learning is not clearly understood. It may have an impact on students' learning if a game-based learning activity is not carefully designed. For instance, commercial off-the-shelf games have the potential to be an important teaching tool because they are interactive, engaging and immersive. However, they are usually costly to purchase or use, rarely tailor-made, sometimes poorly designed, and do not always align constructively with assessments (Biggs & Tang, 2011) for intended learning outcomes. Thus, an in-house developed gamified activity, explicitly designed for developing specific knowledge and skills, emphasising learning that bridges the theory–practice divide and aligns the activity and assessments for constructive learning, is most appropriate. Students today grow up or are familiar with using a multitude of online platforms. Any design for game-based learning must embed an innovative response into the above-mentioned considerations and be available on both the web and mobile devices for maximum flexibility and accessibility.

With all these design considerations in mind, an online game-based learning team exercise was developed in-house as an innovative and highly interactive team activity, specifically for an undergraduate course: 'Knowledge Management & Organisational Learning'. This is a third-year course which sits under both the 'Management & Leadership' and 'Human Resource Management' majors within an undergraduate Business and Commerce program. The main objective of course is to provide students with the insights and skills to facilitate, in their managerial and leadership roles, higher levels of organisational effectiveness, efficiency, competitiveness and cooperativeness in emerging knowledge-based markets.

The course aims to examine the rise of the knowledge-intensive organisation, whether they are for-profit or not-for-profit, and its broad relationship to the new demands of the knowledge economy. Key elements of the course consider the nature and purpose of knowledge, knowledge work, and learning within and across organisations. These connections form the basis for having purposeful knowledge management and organisational learning strategies and systems for developing high performance knowledge and learning organisations. Students are introduced to essential knowledge management and organisational learning principles.

The online team exercise emphasises knowledge and skills including, but not limited to, knowledge management, teamwork, creativity and problem-solving. Thus, the exercise helps students to have a better understanding of and practise the importance of knowledge sharing; knowledge management (that is how to utilise data, information and knowledge for decision-making); team knowledge sharing in virtual teams and a more strategic use of knowledge and learning in organisations. The specific objectives of this new teaching initiative were to assist students to acquire critical concepts of the subject being taught and to practise essential skills that are associated with the subject. Students who would like to become knowledge-oriented leaders in their organisations will find the online team exercise as well as the course particularly useful to them in terms of assisting them to acquire the essential knowledge and skills in the subject matter. The team exercise was used from 2016 to 2018. Around 120 students participated each year in the team exercise in the course. While the course does not have any prerequisites, students are usually advised to only enrol the course in their final year as the course covers the advanced knowledge and skills required to managing knowledge and learning for innovation in organisations. This book chapter aims to evaluate the effectiveness of this in-house developed online team exercise and shed some light on understanding the impact and best practice of game-based learning on online distance learning students at the Higher Education level.

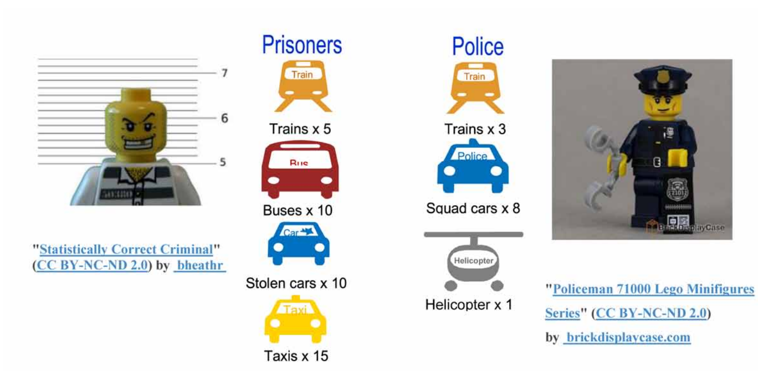
## Online Team Exercise Setting

In the team exercise, online distance learning students were divided into two main clusters: Police Force and Prisoners. Each main cluster had a number of sub-groups in which each sub-group contained six to eight members. Each sub-group was required to work with other sub-groups in their own cluster to achieve their objective. To the Police Force, their objective was to catch all the prisoner groups within the time limit while the Prisoners' objective was to escape without being caught. Altogether, there were ten rounds for the team exercise and students had three weeks to complete it. This allowed time for students to share learning and build teamwork. Each sub-group was required to use different resources (i.e. cars, buses, taxis, trains and helicopters) for catching the prisoners or for escaping from the police on a virtual map. Each type of transportation had different travel distance. For example, a train could travel in a much longer distance without requiring to stop in every node while a squad car was required to stop in every node. The virtual map (in pdf format) allowed the two main clusters to visualise the locations of their own as well as the others. Figure 1 shows how the map looks like in the online team exercise and Figure 2 shows the resources used in the activity.

As the travel distance for each type of transportation was different, in each round students were required to negotiate with their own group members (as well as in the cluster) via a Moodle discussion forum for planning strategies, sharing knowledge and managing resources. They then came up with an agreed decision in each round on where each group would be travelling to (from one node to another) and what resources (types of transportation) they would use for travelling. Both Police Force and Prison-

*Figure 1. Map of the team-based activity*

*Figure 2. Resources used by students in the team-based activity*




ers needed to use a virtual map to visualise where their groups were (see Figure 1) and plan where they would like to travel to (using appreciate transportation types). Each move had to be planned carefully and strategically in order to gain strategic advantage and achieve Police Force and Prisoners' objectives (i.e. for police officers to catch prisoners and for prisoners to escape from the police force) in the online team exercise. Once students had made a decision, they could submit it to the Course Examiner via a delegated Moodle discussion forum.

Through the online team exercise students acquired and practised critical knowledge and skills for making strategic decisions (Braunerhjelm et al., 2010) and effective communication (Cornelissen et al., 2012); pursuing opportunities beyond the resources that are available to them (Thompson et al., 2000; Su et al., 2011); learning to lead (Kempster & Cope, 2010); team learning (Iacobucci & Rosa, 2010); time management and strategic planning (Brinckmann et al., 2009); and creating problem solving skills

(Maxwell et al., 2010). In addition, through knowledge sharing, they are able to generate innovative ideas, to use novel approaches and to apply new knowledge to achieve their group objectives (Pavlovich & Corner, 2006). For instance, in one case, students creatively developed routines and practices to exchange, share, and acquire knowledge as well as resources in order to gain win-win strategic advantage. All these knowledge and skills are critical for graduates in the knowledge society (Coulson-Thomas, 2003) and are what employers looking for from graduates (Graduate Careers Australia, 2016).

The gamified team activity aligns constructively with assessments (Biggs & Tang, 2011) in order to achieve deep learning outcome for the students. After the team exercise is finished, each student prepares their own self-reflection report based on the learning experience they have had individually in the team exercise. This self-reflective report helps students to realise what they lack and what they can do to acquire the essential skills. The self-reflective report as a piece of writing assessment helps students to reflect on their learning journey in the online exercise. Reflective practice and reflective writing have become intrinsic within professional practice education and programmes nationally and internationally (Leigh, 2016). Reflective writing is one established method for teaching students to effectively elicit, interpret, and translate their stories (DasGupta & Charon, 2004). As an outcome of this course, students are able to reflect on their learning experience and how it is linked to the concepts and theories in the course. This also helps students to link the theoretical concepts and practical applications. The concepts or theories in the course that the students could reflect on using their learning experience from the online exercise may include: knowledge sharing; knowledge creation; tacit knowledge versus explicit knowledge; knowledge worker roles; intellectual capital and its components; resource-based views and knowledge-based views.

The team exercise did not require a high level of technology. However, students who engaged in the online team exercise were expected to have access to Internet and a computer or iPad. Students used forum discussions to communicate with their team members during the team exercise. The online capacity of the team exercise allowed students from domestic and international, metropolitan and regional areas to engage and interact and thus learn from each other. The team exercise helped to create an innovative online learning environment that was active, cooperative and engaging to enhance the quality of student experience. Both the online team exercise (formative assessment) and the self-reflective report (summative assessment) formed a critical part of theoretical and practical learning for students as they needed to constructively apply their learning of the concepts and theories to the learning experience in the online team exercise and vice versa.

## METHOD

### Data Collection and Procedures

An online survey of the game-based learning team exercise was conducted during the period of late April to early July 2017 after two online courses finished. Considering that a combination of student differences, such as prior experience or competency, personality, educational ability and gender, may influence student engagement (Boyle et al., 2012; Chory & Goodboy, 2011; Jenson & de Castell, 2010; Kinzie & Joseph, 2008; Witt et al., 2011), we collected the data through a Post-test only with experimental and control groups design. One online course (as the experimental group) was: 'Knowledge Management & Organisational Learning' while another online course (as the control group) was: 'Strategic Management'. Both of the groups were Business and Commerce degree program.

For the experimental group, students learned not only the critical subject content knowledge such as knowledge sharing, knowledge creation and strategic knowledge management, but also practised the essential knowledge management related people skills such as teamwork, people and resource management, time management, interpersonal and negotiation skills, problem-solving and strategic planning in close to real-life scenarios through the online team exercise. As the exercise was designed to align constructively with assessments (Biggs & Tang, 2011) for intended learning outcomes, all students in the experimental group were expected to write a reflective report based on the learning experience they had after the team exercise. Accordingly, all students in that group participated in the online team exercise.

For the control group, students learned the critical subject content knowledge including a traditional and contemporary study of business strategy by using important traditional analytic tools in the analysis of organisations facing the modern-day challenges of a globalised world. Traditional assessment methods such as essays and examination were used. Students from this control group (that is without a team-based activity) were invited to fill in almost the same online questionnaire during the period of late April to early July 2017. Using a Post-test only with experimental and control groups design allowed us to control the risks of reverse causation, time effects and group effects while at the same time measuring the effects of team-based activity on student engagement.

## Sample

Upon completion of the surveys, a total of 71 valid responses were collected from the control group (without a team-based activity) and 69 valid responses were collected from the experimental group (with a team-based activity), representing a response rate of 51% and 53% respectively. Table 1 presents sample distribution of both control and experimental groups. In the control group, about 55 per cent of respondents were male, and 44 per cent were aged between 31 and 40, while in the experimental group, around 57 per cent were female, and 58 per cent were aged 21 – 30.

## Measures

In our online surveys, student engagement was measured using a modified student engagement scale developed by Gunuc and Kuzu (2015). The concept of student engagement was defined as "the quality and quantity of students' cognitive, emotional and behavioural reactions to the learning process … to achieve successful learning outcomes" (Gunuc & Kuzu, 2015: 588). Student engagement was assessed on a five-point scale (strongly agree=5; strongly disagree=1), encompassing cognitive (10 items), emotional (19 items) and behavioural (10 items) engagement. Sample items include: "I motivate myself to learn in this course"; "I have close online friend(s) in my course"; and "I am an active student in the course". Cronbach's alpha values of these scales were 0.78, 0.83 and 0.84 respectively. Using SPSS analysis, an independent sample t-test was conducted to assess the differences between control and experimental groups with respect to student engagement.

*Table 1. Sample distribution*

| | Control group[1] (%) | Experimental group[2] (%) |
|---|---|---|
| **Gender** | | |
| Female | 43.7 | 57.4 |
| Male | 54.9 | 39.7 |
| Transgender | 1.4 | 2.9 |
| **Age** | | |
| 20 years old or below | -- | 8.7 |
| 21 to 30 years old | 25.4 | 58.0 |
| 31 to 40 years old | 43.7 | 20.3 |
| 41 to 50 years old | 22.5 | 11.6 |
| 51 to 60 years old | 8.5 | 1.5 |
| **Employment status** | | |
| Self-employed | 1.4 | 4.4 |
| Full time | 63.4 | 37.7 |
| Part time | 19.7 | 29.0 |
| Not employed | 12.7 | 23.2 |
| Others | 2.8 | 5.8 |
| **Occupation** | | |
| Manager | 46.4 | 35.3 |
| Professional | 31.9 | 20.6 |
| Clerical and administrative worker | 5.8 | 19.1 |
| Others | 15.9 | 25.0 |
| **Years in current organization** | | |
| Less than 3 years | 50.0 | 50.8 |
| 3 to 5 years | 11.8 | 25.4 |
| 6 to 10 years | 19.1 | 17.5 |
| 11 to 20 years | 13.2 | 6.4 |
| 21 to 30 years | 2.9 | -- |
| 31 to 40 years | 2.9 | -- |

[1]n=71 respondents;[2] n=69 respondents

## RESULTS

From the experimental results, it was found that the mean values of the students' cognitive, emotional and behavioural engagement were 3.98, 3.52 and 3.80 for the control group, and 3.80, 3.53 and 4.03 for the experimental group respectively (see Table 2). The t-test result ($t = -2.38$, $p < 0.05$) showed that the students' behavioural engagement in the experimental group significantly improved in comparison with the control group, as shown in Table 2. Further analysis was performed using General Linear Model. After controlling gender and age, the behavioural engagement difference remained significant ($p < 0.05$).

In addition, the effect size measurements showed the magnitude of the experimental effect of game-based learning team exercise. An effect size of experimental effect on behavioural engagement was 0.4207, which means that the behavioural engagement of the experimental group was 0.4207 standard deviations above that of the control group. Although there was no significant difference in cognitive engagement ($t = 1.68$, $p =$ n. s.) and emotional engagement ($t = -0.032$, $p =$ n. s.) between control and experimental groups, cognitive engagement was found to have a negative, small effect size of the experimental effect ($d = -0.2959$) as compared to the control group while emotional engagement indicated a negligible effect size ($d = 0.0057$) (Cohen, 1988).

*Table 2. Descriptive analysis and independent samples t-test*

| | Control group[1] | | Experimental group[2] | | | | |
|---|---|---|---|---|---|---|---|
| | **Mean** | **Standard deviation** | **Mean** | **Standard deviation** | **Difference** | **t** | **p-value** |
| Cognitive engagement | 3.9786 | .59189 | 3.8025 | .59835 | .17610 | 1.68 | .10 |
| Emotional engagement | 3.5243 | .60857 | 3.5276 | .54838 | -.00327 | -.032 | .98 |
| Behavioral engagement | 3.7978 | .59862 | 4.0330 | .51651 | -.23513 | -2.38 | .02 |

## DISCUSSION

Our findings suggest that a team-based activity in an online environment provides a platform for students to engage with one another more structurally than one without a team-based activity. In an online environment, students appeared to be more willing to collaborate and engage with the team and instructor. This is in line with the findings in the literature (e.g., Crocco, Offenholley & Hernandez, 2016; Hamari et al., 2016). In essence, the role of teacher/instructor is important in making this happen, particularly in an online learning environment where people are presumed not to know each other well. A well-developed online team activity could help to take the concept further. This was evidenced by the fact that some students started engaging each other via the discussion forum even before the semester commenced. Many students started assigning roles in their groups. Many students were willing to participate more fully to meet at late hours and discuss the project for extra hours for making decisions.

However experimental results showed that cognitive engagement did not improve significantly and indicated a small negative effect size as compared to the control group. The team-based activity was intended to get online students engaged in intensified discussion through which they should learn to appreciate, compromise, negotiate, influence, create ideas, accept others' ideas and suggestions, initiate changes while taking calculated risks, and solve problems along with each other. Also, they should be able to apply six specific skills: identifying the nature of the problem, determining problem-solving steps, determining problem-solving strategies, choosing appropriate information, allocating proper resources, and monitoring the problem-solving process (Sternberg, 1988). It is plausible that students may not be aware of applying these essential skills when taking part in the activity.

In this study, the emotional engagement did not show a significant improvement upon finishing the team-based activity. Facilitating student learning when no face-to-face contact actually occurs in an online environment can be a challenge (Angelino et al., 2007). The issues of student engagement for online learning would likely be even more challenging. Some students felt that an online course was meant for independent and individual working, and thus there was no immediate need to working virtual teams with the others. Others were frustrated as there was often delay when communicating with other group members in Moodle forum discussions. It may also be due to the fact that the activity was scheduled to finish in three weeks' time (10 rounds), which made it difficult to substantially enhance students' affective response to the learning activity and to their peers and the instructor involved (Appleton et al., 2008).

The team exercise was developed as an innovative online learning approach to overcome the mentioned issues for over 120 online distance learning mode (distance) students in each semester offered for an online course. However, during the development of the online exercise, different challenges were faced. First, very few online exercises were designed and developed for a large online course and this was the first online interactive team exercise developed for teaching knowledge sharing/creation, team learning, people and resource management, time management and problem solving. Despite the rewarding and enjoyable experience, this was a new and innovative teaching initiative for the students involved as well as the course examiner.

To ensure everything was done properly, a team consisting of e-learning designers, media services and learning and teaching support was brought in to assist in the development of the exercise and the interactive map. A number of design considerations were implemented to operationalise the online exercise in enhancing student engagement and learning as well as focussing on students' educational needs for constructive learning. For instance, students are usually concerned about what assessment items are included in a course. Thus, all assessment details (formative and summative) were made available to students two weeks prior to the start of semester. This helped students to be aware of and prepare for the online exercise and self-reflective report. The online exercise instructions were made colourful, interesting and easy to read. The exercise was designed to be challenging, interactive but fun at the same time. The online team exercise was used with the aim of delivering a key message from the course that knowledge sharing and learning are critical to individuals and organisations. It also helped to engage students early, to develop relationships with students such that they felt comfortable to remain in the online course and learn, and to ensure that student learning was not only theoretical but was also practical. All these efforts helped to engage students before and after they commenced their study.

Another challenge was that when running the exercise some distance learning students might actually enrol late. The online exercise was designed to commence in Week Two so that student engagement could start early and was thus more likely to improve retention rates. However, it is not uncommon for students, especially those from international partners, to enrol late in the course (as they may run a semester at a different time). Sometimes students may not enrol until after Week Three in a semester. As the online exercise started in Week Two and ended in Week Four, this could mean that some late enrolled students might miss out the opportunity to fully participate in the online team exercise. To overcome this challenge, all groups (both police and prisoners) were asked to keep notes or minutes of their discussions. This helped the late enrolled students to catch up with what was going on in their group decision making so that they could quickly commence contributing ideas.

Some other challenges related to the different backgrounds of the online students. As one student commented, "I'm not sure it's realistic considering it for an international cohort as time differences are an issue. Also working full time with a family is not always easy to structure set times to meet with groups." Another student was concerned about the free rider problem that may happen in the online team-based activity: "It is highly dependent on other team members, which may affect the success of the activity. This can also bring additional stress dealing with team members when we are also balancing professional careers. I do believe there should be mandatory engagement on the forums but weighted such that those unable/unwilling to engage are only marginally compromised." To this end, a student suggested that there should not be a team-based activity unless there are many students enrolled for the subject in the same country. He added, "my marketing management course had a team based assignment, however I was unable to find team mates because I was the only person enrolled for this course in my country. The course lecturer assigned a few students from other countries for me to collaborate with, however when I tried contacting them, none of them responded. Eventually I had to do the entire assignment by myself."

The success of the online exercise relied quite heavily on effective communication between group members and perhaps even between teams. Many of the involved students were in remote areas where Internet access was limited. The online exercise was set up to use Moodle discussion forums for communication. The idea was that all communication and decisions could be kept central for checking. While discussion forums were very useful in many ways, some students found it hard to get instant responses, and in rural and remote areas the response time could be even longer. To overcome the challenges, students were allowed to use social media such as Facebook and WhatsApp for discussion. This helped to facilitate more effective communication in group discussions. However, students were reminded that a copy of the discussion must be made available to all other students and sent to the Course Examiner as a record. A student suggested that: "the course examiner allocates a 10% to the quality of forum engagement (as if an individual must place one post and one response to a post to each module)". This suggestion was meant to encourage students to participate in the forum discussion. However, this was challenging; if individuals opted out of engaging in the online exercise they would be essentially giving up 10% of their marks. This could affect students' GPA and thus they may feel disadvantaged.

Finally, a gamified activity must not solely focus on fun and interaction. It must be designed with a clear message; one that is directly related to the concepts/theories of the subject being taught and practises essential skills associated with the subject. Also, the gamified activity must align with students' educational needs for constructive learning or they may feel unmotivated, not engaged and these problems may lead to high student dropout rate.

## BEST PRACTICE GUIDE

Given the experiences from the online game-based learning team exercise, the following best practice guides, not meant to be exclusive, are suggested and recommended if a gamified activity is considered or implemented:

1. **Plan and consult:** Make sure you plan and consult colleagues and experts as early as possible and do not underestimate that everything could take longer than expected.
2. **Consider cohort diversity:** Domestic, international, homogeneous, diverse, and culturally different.
3. **Set ground rules:** Make sure you have your ground rules set up early in your forum so that everyone understands what is expected and what they can expect.
4. **Monitor and answer:** Be ready that as a course examiner you may need to step in and make decisions when disputes and uncertainty occur.
5. **Motivate and counsel:** Gamified activities can provide particular learning experiences in which students are immersed in complex tasks where essential skills can be acquired and developed. Be ready to motivate and counsel students if they feel they have failed their objective(s).
6. **Be straight:** Be ready to be straight with students if they are breaking the ground rules.
7. **Reflect:** Be ready to assist students to reflect on their learning of the subject being taught and practice essential skills that are associated with the subject.
8. **Use supporting resources:** Make sure you use other supporting resources such as readings, new articles and videos to enhance students' understanding of the subject being taught.

9. **Clarify:** Make sure students understand that game-based learning is about learning, not about just having fun. At the end of the day, students must be able to learn something from it or the purpose of game-based learning is defeated.
10. **Debrief:** Sometimes learning such as teamwork may not be obvious until students actually have experienced it. Make sure you debrief the essential learning to students if they are not clear.

## FUTURE RESEARCH DIRECTIONS

Plans are already in place to upgrade the team exercise in the near future. This includes adding a mobile version of the online exercise. The desktop and mobile versions will be identical but the mobile version will allow students to have more flexibility and mobility. With this mobile version, on-campus students will be able to participate in the exercise in the classroom like the distance learning students or may even be able to interact with the distance learning students instantly. The mobile version of the team exercise opens up a lot of opportunities for students from different modes to learn simultaneously. The new version of the exercise will be embedded into Moodle allowing easier access. A 'WhatsApp' style of communication will be incorporated into the mobile version for easier communication. This allows students to communicate instantly no matter where they are. Other features including online help, chat history, resource indicators, and reports will be added in the new version. Short videos featuring animated cartoon characters explaining the background stories and key ideas will be added into the new version of the team exercise to make it more interesting, interactive, fun and engaging. Despite all these enhancements, the online exercise remains using a relatively low level of technological requirement. With more flexibility and mobility, the new version would be particularly useful for students who are always on the run or travelling. To this end, there are some avenues for future research. The effectiveness of using online and mobile platforms in enhancing students' emotional, cognitive and behavioural engagement across courses in different modes can be compared. Also the specific soft skills that students may acquire, learn and apply throughout the team-based activity can be studied.

## CONCLUSION

In short, the team exercise is an innovative and highly interactive online teaching initiative for teaching management subjects at the Higher Education level. It helps to engage students with one another as well as with the Course Examiner. This study suggests that a team-based activity in an online environment provides a platform for students to engage one another more structurally than the one without a team-based activity. Students appeared to be more willing to collaborate and engage with the team. However, careful considerations must be put in place when designing a game-based learning activity. If a gamified activity is designed without alignment to students' educational needs for constructive learning, it may have an impact on students' learning.

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# Chapter 19
# Student Perceptions of Learning Digital Literacy Online in a Leadership Program

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## ABSTRACT

*This chapter presents a study that examined student perceptions of taking a digital literacy class online and its effects on the development of leadership skills in relation to the use of technology. It was found that, in general, the participants tended to be satisfied with this online class. Their perceptions of different types of interactions were discussed. The participants tended to perceive that this class was effective in developing their knowledge and skills in using technology to enact leadership practice. The results have implications in online teaching and learning, group projects and technology learning in leadership development.*

## INTRODUCTION

The challenges that educational leaders face in the 21st century include "Globalization and cultural blend", "Ever changing technologies", "Education as a public good or commodities", "Any way maximize the profit", and "Learning at the age of chaos" (Luqman, Farhan, Shahzad, & shaheen, 2012, pp.197-198). These challenges urge the educators, scholars and practitioners to consider how to better prepare educational leaders to meet the needs in this century (Drago-Severson & Blum-DeStefano, 2014). The quality of leadership preparation that the candidates received could influence their subsequent leadership practice and leadership outcome (Orr, 2011; Orr & Orphanos, 2011). In university-based leadership programs, it is important for leadership educators to examine the teaching practice to improve course design and delivery.

Leadership education is defined as "a series of training interventions designed to enhance the knowledge, skills, and abilities of individuals interested in engaging in leadership" (Allen & Roberts, 2011, p. 67). Since one of the challenges that educational leaders face is the rapid development of technology, it

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is necessary for leadership programs to help the candidates to develop the knowledge and skills in using technology to effectively practice leadership.

This chapter reports a study that examined students' perceptions of learning in an online digital literacy class in a leadership program. This class is intended to foster digital literacy among students as it applies to educational leadership practice. Overall, the students tended to be satisfied with learning online in the class and perceive that this class was effective in developing their knowledge and skills in using technology to enact leadership practice. In the following sections, the background information in current literature, research purpose, methods, results and discussions, implications and recommendations are presented.

# BACKGROUND

## Technology and Leadership

Digital literacy is considered important skills in this age. This calls for new competencies of leaders and requires that they lead in the 21st century through fluent use of technology. Like other types of intelligence, such as intelligence quotient and emotional intelligence, digital intelligence is what great leaders need to possess in this new age. Being digitally intelligent means that one understands the reason to use technology, knows different types of technology, makes appropriate selections, effectively uses the technology and has good judgment about the use (Heath, Martin, & Shahisaman, 2017). Using digital literacy concept and social change model, Ahlquist (2014) proposed a digital leadership framework by listing 10 competencies that a digital leader should demonstrate. One competency is "Integration of Digital Technologies into Leadership Presence" (p. 59).

Some research articles discussed the use of digital technologies by leaders. Social media tools such as blogs, wikis, Twitter and Facebook were reported to be used by leaders (Schrum & Levin, 2016). Sauers and Richardson (2015) found that K-12 school leaders used Twitter to create their own communities of practice in education. The topics of their tweets included the use of educational technology, communication with the local community, leadership and sharing resources and conferences information. Being able to use social media for information dissemination and communication is important for the leaders in the 21st century. It was reported that leaders used Twitter to build deeper connections with the followers, share opinions and act as role models (Ingerson & Bruce, 2013). McLeod (2015) suggested school administrators use a targeted discussion protocol, the Technology-Rich Unit Design and Classroom Observation Template, to foster robust conversations about meaningful use of technology. To develop creative and innovative leadership capacity in an organization, simulations, social media, e-mentoring techniques and using technologies to provide multisource feedback were recommended to help leaders to develop requisite knowledge and skills (Antes & Schuelke, 2011).

## Technology Use in Leadership Education

When discussing the impact of technology on leadership development, Hoffman and Vorhies (2017) proposed the concept of leadership 2.0 to echo the shift from web 1.0 to web 2.0. They argued that in this digital age, "educators and students, as well as leaders and followers, must engage in read-write efforts to create organizations and communities of action that are inclusive and integrative of physical and virtual contexts" (p. 22) through the application of technology to leadership development practice. Shinsky and Stevens (2011) noted that "faculty members within Educational Leadership programs have a significant opportunity to influence their students' perspectives regarding current and future use of technology" (p. 198). Therefore, leadership educators have the responsibilities to integrate technology into their teaching practice.

In current literature, researchers have reported the effectiveness of the integration of digital technology to enhance the students' learning in leadership courses, such as Google Docs, Wiki, Wimba classroom (Shinsky & Stevens, 2011), films (Porter & Wimmer, 2012), videos (Friend, Adams & Curry, 2011; Guthrie, 2009) and web-based interactive computer simulation program (Mann, Reardon, Becker, Shakeshaft, & Bacon, 2011). Digital storytelling technique was found to help to facilitate students' critical reflection and self-discovery so they could better understand themselves and what they would encounter in leadership practices (Guajardo et al., 2011). With the development of mobile technologies, in leadership courses, the use of mobile-based polling by students has been reported to help the students understand empowerment, present leadership concepts to followers, strengthen the sense of community among followers, and motivate them (Noel, Stover, & McNutt, 2015). In addition, game-based educational interventions such as the use of gamified learning platform were considered effective in global leadership education (Goryunova & Jenkins, 2017).

The prevalent use of social media tools has an impact on education. Blogging was found to promote students' higher level thinking and support them to reflect effectively in a leadership class (Gifford, 2010). When examining the leadership students' perceptions of the use of social media tools, Odom, Jarvis, Sandlin and Peek (2013) found that the students had a higher comfort level with Facebook and used it more frequently than Twitter, blogging or Wiggio.

McLeod (2011) called for leadership educators to "realize that there is a significant difference between our traditional educational leadership coursework (that occasionally is delivered online) and coursework that puts technology and 21st –century skills and leadership at its core" (p. 4). Educational leadership preparation programs should not only train students to better use technology but also prepare them to become technology leaders (McLeod, Bathon, & Richardson, 2011). To achieve this goal, more scholar work is needed to examine instructional practices in preparing students in leadership programs to use technology to effectively enact leadership practice.

## Online Teaching and Learning in Leadership Education

The leadership educators are expected to model technology use in instructional practices and in methods of communication. Online education is recommended to support leadership training (Phelps, 2012; Radda, 2011). Teaching hybrid or online courses allows educators to demonstrate that technology can be a valuable tool in education (Militello, Friend, Hurley, & Mead, 2011). In higher education, online learning usually is characterized by instructor-led college courses that are dominated by asynchronous activities and are mediated by a Learning Management System (Lowenthal, Wilson, & Parrish, 2009). Such online learning provides learners with a structured and secure learning environment. In this online environment, the learners have self-control of their own learning in the aspects of time, location and learning pace.

Various strategies have been discussed and used to support online teaching and learning of leadership, including integration of web 2.0 technology (Shinsky & Stevens, 2011), discussions, case studies and reflections (Jenkins, 2016) and book review method (Moore, 2008) to teach leadership and develop a sense of community among students. Some researchers have reported the effectiveness of online format in leadership education. Manning-Ouellette and Black (2017) compared the students learning through assignments that were identical in both traditional format and online format in the same leadership course offered in one semester. They found that the students in online format engaged in more deeper learning and reflection than those in the traditional format. Sherman, Crum, Beaty and Myran (2010) collected data using a survey from some students enrolled in leadership programs at two universities to examine their perceptions of online learning. The students' responses revealed that online learning was considered as effective as traditional learning. The majority of the students believed that the online courses prepared them to become an educational leader. Korach and Agans (2011) also found that the students in a blended online program reported similar learning outcome as those in a traditional program. The online environment helped to create a community of inquiry and promote authentic leadership learning.

After examining the findings of the effectiveness of online learning presented in current literature, Nguyen (2015) concluded that "there is strong evidence to suggest that online learning is at least as effective as the traditional format, but the evidence is, by no means, conclusive" (p. 316). Therefore, more research is needed to examine how students learn and how to maximize their learning outcome in the online environment. Specifically, in leadership education, more information is needed to inform the online instructional practice of leadership educators (Jenkins, 2016).

It needs to be noted that although some studies have been conducted to examine online learning in leadership programs, little research has focused on student learning of technology to support leadership practice in an online environment. To better prepare educational leaders in the 21st century, it is necessary for the leadership programs to provide preparation that addresses the use of technology directly and specifically (Hayashi & Fisher-Adams, 2015). A traditional stand-alone technology course can help the students to develop technology skills because they are greatly exposed to various technologies and hands-on experiences (Buss, Wetzel, Foulger & Lindsay, 2015). In a leadership program, a designated technology course can engage students in learning about technology in relation to leadership practice. Since the online format is recommended to support leadership training, leadership students' online learning of technology is worthy of research and investigation.

In summary, to meet the challenges for leading in this century, educational leaders are expected to gain expertise in technology and use technology to enact leadership practice. It is the responsibility of leadership programs to prepare students to become technology leaders in the technology-integrated learning environment. Online education provides such an environment to the students and allows them to immerse in technology-enabled learning activities to empower themselves, which in turn will help them to transfer the knowledge and skills into leadership practice. Online leadership educators need to take the leading role in the efforts of modeling the use of technology and training the students to meet the expectations of leaders in the digital age.

## PURPOSE OF RESEARCH

Leadership educators in higher education can better understand their professional role through "exploration", "experimentation", "validation" and "confirmation" (Seemiller & Priest, 2015, p. 136). In this process, the educators make meaning of their experiences through self-development in expertise, active involvement in the leadership community, conducting research and sharing findings. This chapter reflects such efforts and presents a study conducted in an online digital literacy class in a new cohort graduate program of community and teacher leadership.

The purpose of this study was to examine students' perceptions of learning in this online class Overall, two research questions guided this inquiry: 1) what are students' perceived satisfaction with online learning in this class? and 2) what are students' perceptions of the effects of this course on the development of their leadership skills in relation to the use of technology? Since it was the first time that this class was taught in the program, the research provided an opportunity for the instructor to reflect on teaching experience, which in turn, could help to improve the design and development of this online class. It is also in the hope that the findings in this study would have implications for the professional practice of the leadership educators who teach instructional technology online.

# METHODS

## Context and Participants

In this cohort leadership program, the students are required to successfully complete a digital literacy class before graduation. According to the schedule and the sequence of the courses, this class was offered in a summer semester. Of the 22 students who enrolled in the class, 17 students were in the leadership program and 5 students were in other graduate programs.

The participants of this study were recruited through emails and face-to-face meetings after the students completed the class and got the final grades. A total of 14 students agreed to participate in this study. Nine of them were in the community leader concentration in the leadership program and four of them were in the teacher leader concentration in the program. One participant was in the elementary education program. As for the participants' online learning experiences, only 3 of them took one or two online classes before. Therefore, taking this class was the first experience that many of them had with online learning. Ten students took hybrid classes before and most of them liked the mix of online sessions and face-to-face meetings.

## Online Course

In the summer semester, the students completed the digital literacy course over a period of six and a half weeks. The course was delivered purely online in asynchronous format via Desire2Learn, a learning management system.

A well-structured online learning environment is important for student learning and satisfaction (Ralston-Berg, 2010; Lee, Dickerson, & Winslow, 2012). In this online class, weekly sessions were created to present course content, engage students in learning activities and had them submit assignments. Specifically, there were six sessions and each was labeled with learning topic(s). In each session, learning objectives were specified and an overview of the session was provided. In addition, multiple modules were developed with clearly articulated instructions to guide the students' learning in readings, their participation in online discussions and working on technology-based projects. Also, the instructor created videos to help the students learn to use various technology programs. To help the students stay organized and avoid the hassle in navigation, all the materials and the assignments that the students needed in a given week were put in the weekly session so they could easily find all the information including access to the drop box. In the first two weeks of this class, more than one learning topic was covered in each week. Therefore, two parts were included in each and each part was also clearly labeled.

Interaction plays an important role in student satisfaction with online learning (Croxton, 2014). When discussing the equivalency theorem of interaction in distance education, Anderson (2003) stated,

*Deep and meaningful formal learning is supported as long as one of the three forms of interaction (student-teacher; student-student; student-content) is at a high level. The other two may be offered at minimal levels or even eliminated, without degrading the educational experience. High levels of more than one of these three modes will likely provide a more satisfying educational experience, though these experiences may not be as cost or time effective as less interactive learning sequences. (p. 4)*

Given the asynchronous format of this class, the student-content interaction was crucial. It was enhanced by a structured course organization and content presentation. At the very beginning of the class, the instructor created two online videos to review the syllabus and show the students "how to get started and where to find various course components" (Quality Matters Program, 2014) in D2L. The students were also "introduced to the purpose and structure of the course" (Quality Matters Program, 2014). The two videos oriented the students to the learning environment in this online class.

To support student-instructor interaction, the instructor offered two options to allow the students to communicate with the instructor in virtual office hours. One was to have text-based synchronous communication in the Chat room. The other was to have a videoconference or voice conference using Google Hangout. Outside virtual office hours, the instructor communicated with the students promptly via emails to answer questions and make announcements that were also posted in D2L. To prevent procrastination, the instructor used mobile technology so the students got reminders regarding the deadlines of assignments on their cell phones.

Throughout this summer class, the students interacted with each other and with the instructor in discussion forums. Due to the fact that not all the students were in the leadership program, to help the students get to know with each other, everyone in this class including the instructor made self-introduction online at the very beginning of the class. Group projects were assigned to encourage peer collaborations. In group work, the students were suggested that they communicate with group members using various technology tools. In addition to the formal learning environment, a discussion forum was created in D2L and dedicated to informal interaction among students to support information sharing and the exchange of ideas related to the class.

## Data Collection and Analysis

A survey was administered to the participants for data collection purpose. Thirteen participants took the survey. The survey consisted of four parts. Part one measured the student satisfaction with online learning in the aspects of student-content interaction, student-instructor interaction and student-student interaction. It was modified from the instrument validated by Ahn (2012) and consisted of 10 four-point Likert scale items ranging from 1 (strongly disagree) to 4 (strongly agree). The students' general satisfaction with this online class was measured in part two. It was modified from Arbaugh's (2000) instrument that measured the student satisfaction with online learning and consisted of 7 five-point Likert scale items ranging from 1 (strongly disagree) to 5 (strongly agree). Part three measured the students' perceptions of the effects of this class on the development of their knowledge and skills in using technology to enact leadership practice. Five five-point Likert scale items ranging from 1 (strongly disagree) to 5 (strongly agree) were included in this part. Part four consisted of 3 open-ended questions to solicit the participants' comments.

In addition to the survey, interviews were conducted to get more in-depth information about the participants' perceptions. Nine participants in the leadership program were interviewed in person.

When analyzing the quantitative data collected using the survey, the mean value was calculated for each Likert scale item to find out the participants' thoughts about online learning in this class. Also, individual participant's responses were examined. The participants' responses to the open-ended questions in the survey and their comments in the interviews provided rich and detailed information that shed more light on their responses to the survey items. The qualitative data were analyzed to identify emerging patterns and themes that helped to meet the research purpose.

## RESULTS AND DISCUSSIONS

### Student Satisfaction with Online Learning

#### Quantitative Results

Table 1 summarizes the results of the participants' satisfaction in the aspects of student-content interaction, student-instructor interaction and student-student interaction. The mean value of the participants' responses to each item was reported.

The participants were satisfied with the student-instructor interaction. Overall, they were also satisfied with student-content interaction. The only item that was rated slightly less satisfactory was the navigation of the course sessions and modules (*M*=2.8). In this online class, the first two weekly sessions contained more than one learning topic. To avoid making a lengthy session, each session was split into two parts. Although each part in each session was clearly labeled, juggling between two parts when learning new content may have caused inconvenience in processing the information. As for student-student interac-

*Table 1. The mean value of the students' responses to each item in part one of the survey*

| Items | | Mean (*N*=13) |
|---|---|---|
| Student-content | The course materials used in this online class facilitated my learning. | 3.3 |
| | The assignments and projects in this class facilitated my learning. | 3.5 |
| | This online class was well structured and presented to students in manageable sessions. | 3.1 |
| | It was easy to navigate the course sessions and modules to find out details of learning tasks. | 2.8 |
| Student-instructor | Although I could not see the instructor in this online class, I felt her presence. | 3.4 |
| | I received timely feedback from the instructor. | 3.6 |
| Student-Student | This online class encourages students to discuss ideas and concepts covered with other students. | 3 |
| | This online class created a sense of community among students. | 2.6 |
| | In this class, the online discussion provided an opportunity for critical thinking with other students. | 3.2 |
| | The online discussion in this class was a waste of time. (Reversed) | 3 |

*Note*. The items are four-point Likert scale items

*Table 2. The mean value of the students' responses to each item in part two of the survey*

| Items | Mean (*N*=13) | Mean (*N*=11) |
|---|---|---|
| Taking this class online allowed me to arrange my schedule more effectively. | 4 | 4.2 |
| The advantages of taking this class online outweighed any disadvantages. | 3.7 | 4 |
| I was very satisfied with this course. | 3.7 | 4.1 |
| I feel that this course served my needs well. | 3.9 | 4.3 |
| The quality of the course compared favorably to my other education courses. | 3.6 | 4 |
| Conducting educational technology course via this online mode made my learning effective. | 3.8 | 4.1 |
| If I had an opportunity to take another educational technology course via this online mode, I would gladly do so. | 3.2 | 3.6 |

*Note*. The items are five-point Likert scale items

tion, the participants were satisfied that the discussions with peers allowed them to exchange ideas and engage in critical thinking. However, they did not totally agree that this online class created a sense of community among students ($M$=2.6).

Table 2 presents the results of the participants' general satisfaction with this online course on the basis of seven 5-point Likert scale items. In general, the participants tended to be satisfied with this online class, with the mean scores on most items closer to 4. They were clearly satisfied with the flexibility of the schedule provided by this online class ($M$=4). As for the likeliness of taking another educational technology class online in the future, their response was neutral ($M$=3.2).

When examining the individual participant's responses, each participant's responses to the items were averaged. It was found that seven participants had mean scores ranging from 4 to 5, two had a mean score of 3.9, one had a mean score of 3.4, and the other three with the scores of 2.7, 2 and 1.7 respectively. This means that most of the participants were satisfied or tended to be satisfied with this online course, two participants' satisfaction level was neutral ($M$=3.4) or tended to be neutral ($M$=2.7), and the other two participants were not satisfied with the class ($M$=2, $M$=1.7). Without taking this two participants' data into consideration, the mean value of all the items obtained from the other eleven participants ($N$=11) was equal or above 4 except the last item that measured their inclination to take another class online in the future.

## Qualitative Results

The analysis of the participants' responses to the open-ended questions in the survey and their comments in the interviews revealed that most of the participants felt this online class provided flexibility in time and allowed them to work around their schedule. This echoes the high rating on the survey item "Taking this class online allowed me to arrange my schedule more effectively". This also supports the assertion that one of the benefits of distance education from students' perspectives was "Course flexibility and freedom to work at own pace" (Lei & Gupta, 2010, p. 623). This greatly benefits those who have jobs and family obligations. As one participant noted, "For the adult students, an online class in this format was manageable, feasible and doable."

Nevertheless, two participants explicitly stated that they preferred a face-to-face class as they did not feel connected with peers in the online environment. Another two participants felt it would have been better if there had at least one or two face-to-face meetings. One of them favored real face-to-face meetings over meetings online using video conferencing tools. One participant liked how this class was set up and expressed willingness to take an online class again only if it would be similar to this one:

*I don't know I would do it again unless I had some hint that would be similar, that everything was available to you on the computer. If it wouldn't be available to me, I would really struggle. But you made everything accessible [in this class]. So if another online class came up and I found out ahead of time that you had everything there for you, you can get in touch with students, there is group work, then I probably would.*

The participants' comments reflected different attitudes toward purely learning online and helped to explain the neutral response to the survey item "If I had an opportunity to take another educational technology course via this online mode, I would gladly do so".

When being asked whether they were satisfied with learning in this online class, almost all the participants gave positive answers including the one who had the lowest mean score ($M$=1.7) on the survey items that measured the general satisfaction. Meanwhile, they expressed their thoughts about some activities in this class.

*Student-content Interaction* Overall, the participants were satisfied with the delivery of content in this class. The instructions were clear. There were multiple ways to deliver the information, including text, audio and video. In addition, the instructor reminded the class of the deadlines of the assignments using mobile technology. All of these helped the students stay focused and supported learning online, as one participant commented, "I never felt confused about what the expectations were, which I think is really important when you are doing a class where you are not in person frequently."

One participant pointed out the navigation issue in the first two weeks' sessions. In each of the two sessions, more than one learning topic was covered. To prevent information being presented in a lengthy web page, each session was split into two parts. Each part was clearly labeled and a brief introduction was included. However, going back and forth between the two parts was considered an additional thing added to the workload, as this participant said,

*So, for that week, you get the discussion, you have reading to do and you may have a project to do. So you've got three different things in your learning, then flipping back and forth is just like an additional thing.*

In each part, there were assignments that were due by specific deadlines. Since the two parts were of the same session, similar activities in each part had the same deadlines. This probably made the participant go back and forth to review the materials and check the information. Organizing the learning content by topics may help to present information systematically. However, when the students learn online at their own pace, organizing the information by the type of activities could facilitate the processing of information and enable the students to monitor their own learning conveniently.

*Student-instructor Interaction* In this asynchronous online class, the instructor participated in online discussions, offered office hours online, responded to the students' requests and questions via emails, and sent text messages to the students to remind them of the deadlines. Considering the fact that this class was purely online in an asynchronous format and many students did not have such online experiences before, the instructor responded to the students' requests promptly seven days a week. The participants in this study expressed their satisfaction about this, as one noted, "Very responsive. It could be anytime, like I know I've emailed [the instructor] late before and [the instructor] responded like within 5 minutes or less so that was very helpful."

The participants thought the instructor's videos were not only useful to support their learning but also let them have a sense that the instructor was present and they were not totally alone while learning the use of technology. One participant reflected her experiences:

*I used to get worried like I'm not going to keep up with my assignments on time. I know everything detailed online but you don't meet with your professor and it's hard to have a conversation, but with the way that this class was, how all your instructional videos, we got to hear your voice. I think that made a big difference.*

Although the participants did not physically meet with the instructor, they did not feel the lack of real-time interaction with the instructor hindered the learning process. In addition to the instructor's quick responses and presence in videos, the detailed and clear instructions posted online each week may help to alleviate the potential frustration caused by the lack of real-time interaction with the instructor. The instructor's presence was also reflected in the presentation of content materials and instructions of assignments.

*Student-student Interaction* In this class, participation in online discussions was required. The quality and the number of posts, as well as meeting the deadlines were used to assess the students' participation. The participants had mixed responses about online discussions. Those who favored this type of interaction felt online discussions allowed them to communicate with peers without being confined to location and time. For example, one participant noted, "The online discussions are nice. It gave us a chance to talk to one another when we were all in various places. It was nice. I was able to do the first week while I was away on vacation." However, some participants especially those who preferred a face-to-face class did not think the online discussions helped them build relationships with peers. As one participant explained,

*I'm not going to be as satisfied with maybe any online course as compared to an in-person course or I can have that more intimate interaction with my classmates and really build relationships that feel like a whole. You know we commented on each other's writing and there were people we didn't know. But it doesn't have the same substance maybe or the same kind of authenticity or insight because I didn't know that person's full background.*

The participants' mixed responses about online discussions echoed the neutral response to the survey item "This online class created a sense of community among students." To promote student-student interaction, an informal discussion forum was created to encourage the students to exchange thoughts and ideas. Throughout this class, however, only two students used this feature for communication.

Jaggars and Xu (2016) found that most students considered online discussion "as a forced artificial communication that neither resembled spontaneous personal connections in a face-to-face classroom nor led to active learning" (p. 279). They owed this result partly to the characteristics of the students as non-traditional students whose work and family obligations as well schedule made it hard for them to commit to a community online. This may help to explain the finding in this study, as most of the participants in this study were non-traditional students. Six and a half weeks may be too short for them to build rapport with those whom they did not know prior to taking this class.

Although the participants had neutral satisfaction level with the online community, they enjoyed working on group projects, as it allowed them to communicate and collaborate when working on the projects. Also, they were able to learn from each other. One participant commented that group work helped to moderate the feeling of alienation in online learning:

*It's a little like distancing yourself, so it doesn't feel like an actual class sometimes. But then putting us into groups, like [the instructor] did, it actually did make me feel it was a class and make me feel like this definitely is learning experience, this definitely is learning environment even though we weren't actually in class, which is odd, is strange, but is still good.*

When forming the groups in this class, the students chose group members by themselves. Some students were able to work with those whom they had known in the cohort program, while some worked with the students in other programs. The students were encouraged to collaborate at distance through the use of technology. Interestingly, some participants reported that they met in person when working on group projects. They did not complain about meeting face-to-face with group members while taking a class online. A couple of participants thought it was nice to be able to meet with group members although they took the class online. However, one participant suggested that synchronous online communication be required to engage students in collaboration online. This would allow the students to have real-time communication without having to meet in person and prevent them from simply dividing the responsibilities of group work without having thorough interactions. This participant noted,

*Make sure that the students actually are going to meet on that day and it's part of the requirement, like 3 points for having a Google Hangout. It will just force people to have that interaction that otherwise it's gonna be like "I'm gonna do sections 1 and 2, you're going to do 3 and 4, and somehow somebody is going to put together at the end" it's probably not as good as if you talk through.*

## Effects of This Online Class

### Quantitative Results

The participants' perceptions of the effects of this class on the development of their leadership skills in relation to the use of technology were reported using the mean value of their responses to the items in part three of the survey. Table 3 presents the results.

The participants tended to perceive that this class was effective with all the mean scores closer or equal to 4. The individual participant's responses were also examined by averaging each one's responses on all the items. Seven of them had mean scores ranging from 4 or 5 and one participant had a mean score of 3.8. This meant the majority of the participants perceived or tended to perceive that this class was effective in helping them develop the technology skills to enact leadership practice. Three participants had scores ranging from 3 to 3.4, which meant their perceived effectiveness was at the neutral level. Two participants had scores of 2.8 and 1.6 respectively. This indicated that one of them tended to perceive the

*Table 3. The mean value of the students' responses to each item in part three of the survey*

| **Items:** ***In this class, I developed knowledge and skills of using technology*** | **Mean ($N$=13)** | **Mean ($N$=12)** |
|---|---|---|
| To foster an environment conducive to the realization of the vision for school improvement or community development. | 3.7 | 3.9 |
| To collect data, analyze data, and make leadership decisions. | 3.8 | 4 |
| To support productive systems for learning and administration. | 4 | 4 |
| To enhance my professional practice. | 3.7 | 3.9 |
| For communication and collaboration when exercising leadership | 3.8 | 4 |

*Note*. The items are five-point Likert scale items

effectiveness of this course was at the neutral level, but the other one did not think this class was effective. After dropping the data of the participant who had the lowest mean score ($M$=1.6), the mean value of the other twelve participants' responses ($N$=12) on each item was either 3.9 or 4, as shown in Table 3.

## Qualitative Results

Most participants thought that in this class, they were exposed to various programs, their confidence in using technology increased, and they learned new technology skills that could be used in leadership practice. There were also different voices. Two participants thought that most of the technology programs covered in this class were not useful or relevant to their work. One of them preferred learning social media tools, such as Twitter. The other participant did not think the technology programs learned in this class would be necessary for future work. Unlike these two participants, one participant thought the programs covered in this class were very helpful, however, this participant did not learn much new knowledge due to the familiarity with some programs prior to taking this class. This result is not surprising because the students had different levels of technology skills. Also, in this class, there were students in community leader concentration and students in teacher leader concentration. Although the instructor tried to meet the needs of both groups when developing the course content, some students may have more specific requests. Differentiated instruction and learning would be helpful.

### *Role of Technology in Leadership Practice*

Almost all the participants agreed that technology was important and necessary in leadership practice. Only one participant felt that technology would not be indispensable in the community work that this participant planned to do and basic technology, such as phone and emails, would be enough. When describing the role of technology in leadership practice, the participants repeatedly used the word "communication" in their comments. They perceived that technology could be used for communication and dissemination of information. As one participant noted, "Technology could assist communication, make it easier to build relationships and participate. It could serve as a vehicle to identify community resources and share information. It could also support advocacy campaigns and planning."

One participant thought technology could be used to improve collaboration, "Technology plays an important role in leadership level. Technological advancements have made things easier for those in management leadership roles. Moreover, technology is a great tool to improve collaboration, because collaborations are the cornerstone of modern leadership."

Two participants in teacher leader concentration emphasized the importance of technology in classrooms. One of them also pointed out that technology resources in schools could influence the use of technology by teacher leaders.

### Leadership Development

The majority of the participants reflected that this class helped to develop their leadership skills to some extent. The technology they learned in this class helped them better present information and share information with people. One participant noted,

*As a leader, it's my responsibility to keep up with the times, be able to send people my information, be able to communicate with them in the best way that's possible to pass around the information. If they can't come to the meeting, I don't have to say I'm going to forget about that person because they can never come. Instead, saying how can I make it accessible to them as well. Maybe we record the meeting and we send to them. Maybe we do it online and everybody doesn't have to come. And we just do it on the computer.*

The technology skills that the participants learned in this class also made them think about how to incorporate technology into their work and demonstrate leadership in a tangible way. One participant commented:

*I think that the programs that were new are going to be things that I leveraged in my current work. So that in some way that is a demonstration of leadership like taking something you learn and actually put it into use and expose other people to it.*

This class helped some participants develop confidence in being a leader. One participant in teacher leader concentration said, "Because I learned more about technology, I could be a leader in a group of people whether they be students or other educators. I could help them with technology. It helped me involved."

The group work in this class provided an opportunity for the participants to practice leadership. One participant described how working in a group helped to develop leadership skills.

*It taught me how to take leadership, in general. In my group, I was teaching them a few of the different ways that helped me to learn how to use the product or how to use the software. I was able to take lead, putting certain things together, distributing roles, distributing like who is going to do what and where. Sometimes I was able to let that leadership go and give it to someone else.*

Two participants were not sure whether the class had helped to develop their leadership skills but were optimistic that what they had learned in this class would be helpful when they practice the leadership. One participant commented,

*I don't know about the development of my leadership skills. But I think it can help me in organizing my leadership skills and promoting my leadership ability. This class is really good for that . . . I think me personally becoming building more skills as a leader, it has not yet. But I think that's possible because I* *think more communication with more people, getting more information could make me a better leader. But I think that like in the short term. Since this class that I think it's definitely improved my technological awareness and my ability to give a presentation in my organization, in the future, it can help me to reach out to more people.*

Two participants did not think this class had helped them to develop leadership skills. One of them felt a good job could be done without technology. The other thought the class did not cover the use of some social media tools that were widely used for communication, such as Twitter.

## IMPLICATIONS AND RECOMMENDATIONS

When discussing the trends in the design of online classes, Lister (2014) suggested considerations of course structure, content presentation, collaboration and interaction, and timely feedback, as they influenced student engagement and learning. This study examined student satisfaction with an online digital literacy class and its effects on the development of their leadership skills in relation to the use of technology. The results have implications for online teaching and learning, group work and technology learning in relation to leadership skills development. Some recommendations are given for future practice.

### Online Teaching and Learning

When examining the perceptions of graduate students in educational leadership programs on online learning, Sherman, Crum, Beaty and Myran (2010) found that the students preferred hybrid courses followed by traditional courses. In this study, some participants also demonstrated their preference to hybrid format and traditional face-to-face learning because of the lack of spontaneous interactions in purely online courses. The students have different learning styles. Should distance technology resources allowed, offering the options to attend class sessions either online (synchronously or asynchronously) or face-to-face would help to the meet the needs of all the students.

The results in this study indicated that asynchronous online learning provided schedule convenience, however, the lack of synchronous communication may affect the natural flow of interactions between students. The incorporation of video conferencing tools can support real-time communication and increase the immediacy in online learning, which in turn, may help to develop a sense of community.

Jaggars and Xu (2016) observed that effective student-instructor interaction was valued more strongly than student-student interaction by the students in online courses. Paechter, Maier and Macher (2010) also found that the instructor's support and student-instructor interaction strongly contributed to the student satisfaction with online learning. In this class, the participants were satisfied with student-instructor interaction. The instructor's quick responses to their requests, instructor's presence in videos and online discussions, and the use of mobile technology to remind the students of the deadlines may all contribute to the feeling that the instructor was present in this asynchronous online class although the instructor was not physically visible. In addition to interaction, the instructor's ability to develop "coherent and structured learning material" (Paechter, Maier, & Macher, 2010, p. 228) was reported to be important for student satisfaction with online learning. The findings in this study implied that creating a user-friendly course with an organized structure, clear presentation of learning objectives and content could facilitate student-content interaction and support student learning.

The participants' satisfaction with online discussions and online community was at a neutral level. They had mixed responses about online discussions. Individual factors, such as time constraint and learning styles could affect the students' participation in online discussions (Deng & Tavares, 2013). In this study, the participants' preference for course format influenced their perceptions of online discussions. Also, being non-traditional students did not fuel their interests in engaging in a community online (Jaggars and Xu, 2016). To develop online learning communities, it was suggested that the instructors employ strategies to encourage students to have both task-oriented discussion and social interaction (Yuan & Kim, 2014). In this study, formal online discussions were required to promote the students' learning. In addition, an ungraded discussion forum was created to support their informal discussion and social interaction. However, only two participants used it and created three posts. When examining the students' engagement in online communities via Moodle and Facebook, Deng and Tavares (2013) found that the students preferred using Facebook to have online discussions and share information. The easy-to-use interface and the news feeds feature in Facebook promoted interaction. In the summer when the participants in this study took this online class, they used Desire2Learn which did not have feeds tool. To access any discussion forum, they had to go to the course content page. Such inconvenience may have contributed to the lack of use of the discussion forum dedicated to informal discussion. After the study was conducted, Desire2Learn Daylight was adopted on campus. Feeds is a feature in Daylight and available in course home page. The instructor can use this feature to engage students in social interaction, share information and support each other. If the feeds feature is not available in a learning management system, the instructor can consider incorporating social media tools that are widely used by the students to help to develop a personal relationship and build online learning communities.

## Group Projects and E-Leadership

Jenkins (2016) found that group work was not valued in online leadership courses. Interestingly, this is opposite to the findings of this study. The participants thought the group work allowed them to communicate with each other and get peer support. When working on group projects, the participants had opportunities to practice leadership in groups. With education going online and the advancement of technology, the concept of leadership has been impacted and e-leadership is getting more and more attention in leadership education (Phelps, 2014). According to DasGupta (2011), "E-leadership is a new leadership paradigm that requires the leader to achieve these leadership objectives in a computer-mediated manner with virtual teams that are dispersed over space and time, the main medium of communication amongst leader(s) and followers being the electronic conduit supported by computers." (p. 29). E-leadership requires the leaders to demonstrate skills for leading a virtual team or leading in an online environment. To promote the development of such skills, leadership educators need to employ strategies to help the students cultivate leadership online.

When discussing teaching and learning leadership in the online environment, Phelphs (2012) suggested that the educators identify "opportunities for current students to practice skills related to task ownership and problem-solving with a virtual team", as this could prepare the students "for future success" (p. 68). In this class, the students worked on group projects, which provided them an opportunity to practice leadership skills in groups. Although they were encouraged to have online collaboration via technology, some participants reported that they actually met in person when working on group projects. To facilitate the development of e-leadership, the group projects in a leadership class need to be systematically designed to make online interaction of group members mandatory and be part of the assessment of the group work. One participant in this study actually expressed the necessity of online interaction when working on group projects in the online class. It would make collaboration more accessible, support spontaneous communication in a natural flow, create an authentic virtual team and motivate each member to be responsible for the group work. This does not only promote effective and efficient collaboration but also help the students develop the necessary skills for leading in virtual environments.

## Technology Learning and Leadership

The majority of the participants perceived or tended to perceive that this class was effective in developing the knowledge and skills to use technology to enact leadership practice. In their perceptions, the technology could be used to support communication, collaboration and dissemination of information. What they learned in this class helped to develop their leadership capacity. Meanwhile, there were participants who did not think the technology programs they learned in this class were useful. It was suggested that "In a leadership course, putting the focus on students and their goals is key" (Gutheir, Shields, & Zernick, 2014, p.64). In this online class, the students had different levels of technology skills and different professional pursuits; therefore, they may have different expectations of learning outcome. To optimize the students' learning experiences, differentiated learning would be helpful. For example, when learning about the application of social media in leadership practice, the students could be provided with a number of tools and be guided to explore the use of one or two social media tools according to individual needs. This would enable the students to explicitly connect learning with practice and have a deeper understanding of the application of technology. As for the students who do not have the opportunity to practice leadership yet, learning about the use of technology could be situated in their career intentions and linked to planned behaviors.

The purpose of leadership preparation is to "develop the leadership skills and capacities of candidates as future leaders and to develop their aspirations and capacities to seek advancement and become educational leaders" (Orr, 2011, p. 117). The purpose of this class is to foster digital literacy among the students as it applies to leadership. Therefore, the technology knowledge and skills that the students learn in this class should help to enhance or develop their leadership capacity. Social media, instant messaging applications, and the programs that support effective and efficient communication, collaboration and information distribution are what today's leaders need to be able to use. In instructional technology classes in leadership programs, the students should be exposed to such technology and learn to apply the technology to leadership practice.

To better prepare leadership students to use technology, leadership educators need to model the use of technology. For example, distance technology can be used for student-instructor interaction in either online classes or hybrid classes. Observing the instructor's technology use would influence the students' perceptions of the use of technology and motivate them to incorporate it into their group work. As a result, their online communication and collaboration experiences will be transferred to their professional practice as leaders and enable them to demonstrate e-leadership when working with virtual teams.

## CONCLUSION

This paper reports the student satisfaction with an online digital literacy class in a leadership program and their perceptions of the effects of this class on their leadership development in relation to the use of technology. Although the study reported here is limited in scope and the sample size is small, it provides practical information about teaching leadership students online and preparing them to use technology to practice leadership. Hopefully, the findings presented here would be helpful for leadership educators to design, develop and deliver online classes. Moreover, the implications of this study would suggest directions for future practice in teaching leadership students to use technology to provide leadership. As Seemiller and Priest (2015) believed that, "as leadership educators continue to share, listen, and learn from the stories of one another's professional journeys, we will uncover questions for inquiry that generate new ways of knowing and being" (p. 145). It is anticipated that future research would provide more useful information about leadership educator's practice and help to better prepare students to become effective leaders in the digital age.

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# Chapter 20
# Time Well Spent:
## Flipped Classrooms and Effective Teaching Practices

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## ABSTRACT

*Good teaching practices are the crux of student education and require constant evaluation to meet current generations' learning needs. Flipped classrooms have sought a foothold in higher education to provide opportunities for deep learning through the delivery of content online prior to attending class while having activities related to processing and applying the information during class. Using a large-scale, multi-institution study of faculty teaching flipped courses, this study empirically links flipped procedures to other forms of effective educational practice and additionally focuses on the motivations and impacts on the faculty side of this pedagogical practice. Findings indicate numerous learning and development benefits for students with implications for supporting and motivating faculty across disciplines, faculty identities, and course types.*

## INTRODUCTION

A new generation of student beckons a new learning environment and many scholars point toward flipped classrooms as a solution (Bishop & Verleger, 2013; Gannod, Burge & Helmick, 2008; Roehl, Reddy & Shannon, 2013). Flipped classrooms have sought a foothold in higher education to provide opportunities for deep learning through layering course material throughout each class session (Du, Fu, & Wang, 2014; Herreid & Schiller, 2013), which is known to reinforce the importance of cumulative knowledge and application (Lang, 2016). Although flipped practices can take many forms, there are a few common indicators. Often faculty provide students with study questions while viewing at-home modules

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to help process the content as they normally would during class. Students do not often ask questions in large lectures, and few students reported missing the opportunity to do so while taking a flipped course (Foertsch et al., 2002). Additionally, collaborative learning is frequently a component of a flipped class (Gannod et al., 2008; Foertsch et. al, 2002). This class structure professionalizes students by providing skills they will need in the workforce (Foertsch et al., 2002).

Good teaching practices are the crux of student education (Bain, 2004), and require constant evaluation to meet current generations' learning needs (Seemiller & Grace, 2016). Assessment of flipped classrooms have historically had mixed results; however, the active learning component makes it a strong contender for modern higher education (Nilson, 2016; Roehl, Reddy & Shannon, 2013). However, little is known about faculty perspectives related to flipped courses as well as the link between course design and student engagement. The study seeks to weigh the costs of a flipped classroom to the benefits by answering the following research questions:

1. What kinds of faculty and in what types of courses are more likely to be flipped?
2. What factors most strongly motivate faculty to flip their courses?
3. How does the amount of time faculty spend on teaching-related practices differ in flipped and traditional courses?
4. How does having a flipped course relate to effective educational practices?

## BACKGROUND

Student engagement is defined in higher education as the time and effort students put forth toward meaningful educational opportunities (Kuh, 2009). Often the onus is placed on students, yet faculty have a shared role in creating environments conducive to student learning (Chen, Lattuca, & Hamilton, 2008; Lester, 2013). Faculty engagement in the teaching and learning process is vital to student success. Umbach and Wawrzynski (2005) found frequent student-faculty interactions during courses was positively related to increased student perceptions of a challenging, active, and collaborative learning environment. Moreover, the students report higher social and personal development when having more frequent faculty interactions in classrooms (Umbach & Wawrzynski, 2005). These insights are promising as flipped-designed courses free up time for increased student-faculty interactions in classes.

Evidence has demonstrated the success of flipped classrooms (Bergmann & Sams, 2012). "The flipped model puts more of the responsibility for learning on the shoulders of students while giving them greater impetus to experiment" (Educause, 2012, p. 2). Ambrose and company (2010) found students who reflect on their ability to solve a problem are more likely to study and achieve the outcome. Moreover, if students do not achieve the outcome that is set for them, good learners will try a new strategy and likely succeed after another attempt. By having to teach themselves outside of class, students may more thoroughly master content. In addition, the flipped classroom design has shown to yield significant improvements in student self-efficacy as compared to a traditional classroom design (Thi Thai, Wever, & Valcke, 2017).

Researchers posit the effects of a flipped classroom could teach students study-skills that are beneficial to their success in other courses (Bauer & Haynie, 2017). Thus, the outcomes are assumed to be moderated by self-monitoring as literature shows students who have high levels of the skill are more successful (Ambrose, Lovett, Bridges, DiPietro, & Norman, 2010). This is likely since flipped classrooms parallel "small teaching," a paradigm that researchers have found increases student learning (Lang, 2016). The practice recommends frequent quizzing of students at the beginning and end of classes to activate knowledge retrieval processes, which boost students' learning (Lang, 2016).

The flipped student-centered approach aims to increase higher levels of student engagement. (Gilboy, Heinerichs, & Pazzaglia, 2015). Unlike traditional in-class lectures where students are passive observers, the flipped design incorporates aspects of constructivist learning. In this learning environment, new knowledge is constructed rather than merely transmitted from instructor-to-student. A constructivist approach lends itself to a class design where instructors are no longer viewed as "the sage on the stage, but a guide on the side." (King, p. 30). In assuming the role of facilitator, faculty members prompt students to use their own knowledge to engage with course content that encourages making connections, questioning, reflection, and higher ordered thinking (Hockings, Cooke, Yamashita, McGinty, & Bowl, 2008). Furthermore, the flipped design aligns with research that suggests that class time utilized for knowledge application promotes deeper comprehension and increased engagement (Ferreri & O'Connor, 2013; Pluta, Richards, & Mutnick, 2013). In examining nutrition courses, researchers found students preferred flipped classrooms' active learning as opposed to traditional strategies (Gilboy, Heinereichs, & Pazzaglia, 2015).

The flipped classroom has been applied in many disciplines: software engineering, cinematography, and statistics (Enfield, 2013; Gannod, Burge, & Helmick, 2008; Wilson, 2013). Wilson (2013) claimed students taking statistics in flipped classrooms scored higher cumulative grade point averages than control groups. Additionally, Foerstch and company (2002) found students believed electronic lectures to be more useful than in-person lectures. Enfield (2013) discovered students reported educational technology helpful to learning course material by working alongside videos and taking notes during the take-home portion of flipped classrooms. Furthermore, Mok (2014) found that a major advantage for students under the flipped design is having the option to watch each video lecture as many times as it requires to hold a deep understanding of course content prior to attending class. Using integrative teaching practices has demonstrated an increase in student interest and learning in STEM fields (Becker & Park, 2011); thus, it is important to continue to experiment with new pedagogy to improve educational experiences for all students

The flipped classroom not only has benefits for students, but for faculty as well. The course structure is excellent for lower-level courses, which faculty are often not too keen on teaching; the new teaching paradigm can instill excitement to old content (Gannod et al., 2008). Moreover, by not having to worry about covering specific content in a timely manner during class, instructors can schedule guest lectures to introduce students to a breadth of perspectives. While it can be more time consuming to use a flipped paradigm due to content creation, the model will save faculty class planning time in the future by affording faculty the option of reusing previously recorded material. This previously recorded material may also function as a way to avoid a loss of instructional time when faculty members have to cancel an in-class session. Instead of forfeiting lecture time, students may receive meaningful instruction without the instructor present (Roehl et al., 2013). Faculty provide opportunities for deep learning through layering course material throughout each class session, which is known to reinforce the importance of cumulative knowledge and application (Lang, 2016).

While the flipped classroom model has increasingly become a popular innovative practice, research has indicated that there are several challenges that may accompany the use of this teaching model for faculty members. Recent studies have shown that the adoption of a flipped classroom design can be more time intensive and laborsome for those faculty members engaging in the task of creating flipped video lectures (Enfield, 2013; Taylor, 2017). Moreover, faculty efforts to implement new innovative teaching practices are seldomly recognized, which has led to a lack of institutional support and training in implementing a flipped classroom design (Correa, 2015). Additionally, it has been documented that faculty members struggle to get students to complete watching the pre-class video lectures and other assigned activities prior to coming to in-class sessions (Correa, 2015; Honeycutt, 2016). This prevents students from developing a solid understanding of course content and fully engaging within the in-class sessions.

The challenges associated with a flipped classroom design are not limited to faculty, but are also experienced by students in varying ways. Studies have shown that the majority of students have grown accustom to traditional in-class lectured based classes, which in turn make it more difficult for some students to adapt to a non-traditional flipped classroom design (Guerrero, Beal, Lamb, Sonderegger, & Baumgartel, 2015; Strayer, 2012). As the non-traditional flipped teaching model encourages autonomy in grappling with course content and more directly places the learning on the individual student, students may lack the requisite skills to become self-directed learners (Hao, 2016). Furthermore, Bishop and Verleger (2013) found that in general student perceptions toward the flipped classroom tend to be positive, but invariably there were students that strongly opposed this non-traditional teaching approach. Another challenge found within the research suggests that students in a flipped course are not afforded the opportunity to ask clarifying questions or receive immediate feedback at the time of viewing video lectures (Ramírez, Hinojosa, & Rodríguez, 2014). Therefore, students may run the risk of misinterpreting core course content or not adequately comprehending course material. Lastly, the implementation of a flipped classroom may present technical or software issues for students trying to view video lectures (Du et al., 2014; Ramirez et. al., 2014; Milman, 2012). The technological component of a flipped design may further serve as a challenge for economically disadvantaged students that find it difficult to access the required technology for full participation in the class (Du et al., 2014; Milman, 2012).

## MAIN FOCUS OF THE CHAPTER

### Issues, Controversies, Problems

Much of what we know about flipped courses focuses on the student perspective, leaving the faculty side to be very anecdotal (McNally et.al, 2016; Wilson, 2013). This study empirically links flipped courses to other effective educational practices and takes care to focus on the motivations and impacts (in terms of time) of the faculty side of this pedagogical practice. This section gives context to the study as well as methodological details.

#### Limited Resources

Lack of time and limited resources are frequent roadblocks for innovative practices necessary to advance the central missions of higher education institutions. For flipped classrooms to be successful, the visuals created for students need to be succinct and faculty need to plan in-class activities well in advance (Nilson, 2016). In tandem, the time required to assess new practices can curtail the continuation of such practices, thus institutions and departments should provide faculty time, resources, and support to advance instructional methods. Providing time for faculty to pursue endeavors related to flipped classrooms and new practices will be beneficial for both students and faculty.

Integral to providing faculty the resources for flipped classrooms is finding ways to support them in new endeavors. Stupnisky, BrckaLorenz, Yuhas, and Guay (2018) found faculty with autonomous or intrinsic motivation more often incorporate effective strategies, higher order learning, and collaborative learning into their courses; these often being staples of flipped classrooms. Moreover, in a study investigating higher education instructors' decisions to adopt a flipped classroom design, Long, Cummins and Waugh (2018) found that performance expectancy and technology self-efficacy were the leading predictors for instructors choosing to implement the flipped classroom model. Faculty motivation for adapting teaching methods should be understood to assist them in moving their pedagogy from traditional methods toward embracing new paradigms. Findings from this study shed further light on the reasons faculty decide to make the switch to flipped strategies.

Considering the canon of pedagogical research, there is limited knowledge on the benefits or challenges of flipped classrooms. Continued assessment of teaching practices and their effects on students are essential for understanding how to best promote learning. While this study provides an overview of flipped classrooms as it relates to faculty practices it did not assess the effects on students. Quasi-experimental methodologies may be best suited to understand the relationship between classroom practices and student learning outcomes.

### Who Benefits from Flipped Classrooms

Some view flipped classrooms as stifling due to students' inability to ask questions as they listen to content. However, some faculty in lectures disagree as students have the most questions when they are attempting to apply their knowledge thus demonstrating a need for flipped classrooms (Foertsch et al., 2002). The flipped classroom paradigm will likely challenge faculty to change their philosophy on teaching, leading to positive or negative effects on the classroom experience.

Student resistance to the new pedagogy has been a source of limitation for many new ways of teaching (Nilsen, 2016). Oftentimes, students fear change and prefer learning in a specific manner (as they did during primary and secondary education) so when it comes time for new pedagogies in college, they are often hesitant to buy-in (Roehl et al, 2013). However, involving students in the course design process may combat this limitation. Nilson (2016) claimed it is important to allow students to define their own learning goals to help them rethink how they are obtaining their content.

Literature demonstrates numerous studies have been conducted on student satisfaction of flipped classrooms, but few on engagement or related indicators of learning (Enfield, 2013; McNally et al., 2017; Wilson, 2013). Flipped classrooms were designed to improve learning yet there is a limited understanding of faculty perceptions of how the design affects students.

## Methods

### Data

The data for this study come from the 2018 administration of the Faculty Survey of Student Engagement (FSSE). Staff designed FSSE to complement the National Survey of Student Engagement which staff administer to undergraduate students. The purpose of FSSE is to measure faculty and instructor perceptions of and involvement in undergraduate student engagement at four-year colleges and universities. More specifically, FSSE measures faculty use of effective teaching strategies, the nature and frequency

*Table 1. Select Items in the FSSE 2018 Flipped Classroom Item Set*

| |
|---|
| **Earlier, you answered some questions based on one particular undergraduate course section you are teaching or have taught during this academic year. Thinking again about that course, please respond to the following questions.** |
| **A *flipped* course swaps traditional in-class learning with typical out-of-class learning. For instance, new information is delivered online prior to attending class while activities related to processing and applying the information are completed during class.** |
| **About how much does your selected undergraduate course fit this description of a *flipped course*?** |
| **To what extent did the following reason(s) prompt you to teach a flipped course?** |
| Response options: Very much, Quite a bit, Some, Very Little |
| a. I was awarded a teaching grant that supported innovative curriculum (re)design |
| b. I was influenced by my institution, department, and/or faculty peers |
| c. I believed it would improve students' retention of factual or procedural knowledge |
| d. I believed it would improve students' metacognitive skills |
| e. I wanted to address student feedback from a previous course that I taught |
| f. I needed to redesign the course due to the volume of course content |
| g. I needed to redesign the course due to the high student-to-instructor ratio |
| h. Other, please specify: |

of student-faculty interactions, faculty values for institutional support and other aspects of student learning and development. Every year FSSE appends extra item sets to the end of participating institution's administrations to further explore topics of interest to the field of higher education. In addition to using items from the core FSSE survey, the primary focus of this study was on an extra item set about teaching practices and motivations surrounding flipped classrooms (see this chapter's measures section and Table 1 for more details). Eighteen institutions, resulting in 1,353 faculty respondents, received this set.

## Measures

A key variable of interest in this study asks faculty how much their selected undergraduate course fits the following description of a flipped course: "A *flipped* course swaps traditional in-class learning with typical out-of-class learning. For instance, new information is delivered online prior to attending class while activities related to processing and applying the information are completed during class." For this study, courses were deemed to be "flipped" if faculty responded that their course fit this description "very much" or "quite a bit;" courses where faculty responded "some" or "very little" will be referred to as "traditional." The other items from this set studied here involved the reasons faculty chose to flip their course. Examples of such reasons were receiving a teaching grant that supports innovative curriculum design, believing it would improve students' retention of factual or procedural knowledge, and needing to redesign the course due to the volume of course content. The listing of these items are in Table 1.

From the core FSSE survey, this study used a variety of items to answer the research questions. Faculty demographics and employment characteristics included disciplinary area, academic rank, tenure status, gender identity, racial/ethnic identification, and sexual orientation. Course characteristics included course format (in person, online, etc.), course load, class level, previous experience teaching the course, whether the course fulfills a general education requirement, and the enrollment size of the course. Additionally, the study examined items asking faculty how much time they spend on a variety of teaching-related behaviors (preparing for class, grading assignments and exams, meeting with students outside of class, etc.). The study used eleven scales from the core FSSE survey to examine the relationship between the use of flipped course characteristics and effective teaching practices:

- Higher-Order Learning—how much faculty emphasize challenging cognitive tasks such as application, analysis, judgement, and synthesis (4 items)
- Reflective & Integrative Learning—how important it is to faculty that their students make connections between their learning and the world around them, reexamining their own beliefs, and considering issues and ideas from others' perspectives (7 items)
- Learning Strategies—how much faculty encourage students to actively engage with and analyze course material rather than approaching learning as absorption (3 items)
- Quantitative Reasoning—how important it is to faculty that their students evaluate, support, and critique arguments using numerical and statistical information (3 items)
- Collaborative Learning—how much faculty encourage students to work on group projects, ask peers for help, explain difficult material to others, and prepare for exams by working with other students (4 items)
- Discussions with Diverse Others—how much opportunity faculty provide for students to interact with and learn from others with different backgrounds and life experiences (4 items)
- Student-Faculty Interaction—how often faculty interact with undergraduate students they teach or advise outside of courses (4 items)
- Effective Teaching Practices—how much faculty provide organized instruction, clear explanations, illustrative examples, and effective feedback on student work (8 items)
- Quality of Interactions—faculty perceptions of students' supportive relationships with other students, advisors, faculty, and staff (5 items)
- Supportive Environment—how important it is to faculty to increase institutional support across a variety of domains including cognitive, social, and physical (8 items)
- Course Goals—how much faculty intentionally structure their courses so that students learn and develop in general education, intellectual skills, and personal and social development (10 items)

See more findings using these items and measures at fsse.indiana.edu.

## Respondents

Respondents in this study are limited to those faculty who responded to at least one item in the flipped classroom extra item set. Find details about faculty respondents' demographics by having a flipped course in Table 2. Overall, the faculty respondents were from a variety of disciplinary areas with the largest proportions in Art and Humanities (24%), Health Professions (13%), and Social Science fields (12%). Respondents that held the rank of Full Professor (29%), Associate Professor (24%), and Assistant Professor (27%) represented the large majority, while those holding the rank of Full-time Lecturer/Instructor (11%) and Part-time Lecturer/Instructor (9%) represented smaller proportions. A little more than half of the faculty identify as women (51%), and less than half identified as men (43%). Due to very small numbers, faculty who chose another gender identity other than man or woman were excluded from this study. Two-thirds of the faculty identified as White (66%) with smaller proportions identifying as Black or African American (12%), Asian (4%), Hispanic or Latino (3%), multiracial (3%), and other racial/ethnic identifications.

Faculty choose one course to think about when answering questions on FSSE, and the faculty in this study exhibited variations in their selected course characteristics. Find details about faculty respondents' course characteristics by participation in a flipped classroom in Table 3.

*Table 2. Select Faculty Demographics and Characteristics by Flipped Classroom Status*

| | Flipped Course (Row %) | Traditional Course (Row %) | Total (Column %) |
|---|---|---|---|
| *Disciplinary Area* | | | |
| Arts & Humanities | 16.6 | 83.4 | 23.6 |
| Bio Sciences, Agric, & Natural Resources | 11.9 | 88.1 | 6.8 |
| Phys Sciences, Math, & Computer Sciences | 14.6 | 85.4 | 10.6 |
| Social Sciences | 16.6 | 83.4 | 12.3 |
| Business | 25.4 | 74.6 | 10.3 |
| Comm, Media, & Public Relations | 12.5 | 87.5 | 3.9 |
| Education | 23.4 | 76.6 | 9.0 |
| Engineering | 7.4 | 92.6 | 2.2 |
| Health Professions | 23.5 | 76.5 | 13.2 |
| Social Service Professions | 26.8 | 73.2 | 3.3 |
| Other disciplines | 13.8 | 86.2 | 4.7 |
| *Academic Rank* | | | |
| Full Professor | 15.6 | 84.4 | 29.1 |
| Associate Professor | 18.7 | 81.3 | 23.8 |
| Assistant Professor | 18.1 | 81.9 | 27.0 |
| Full-time Lecturer/Instructor | 28.0 | 72.0 | 11.3 |
| Part-time Lecturer/Instructor | 16.7 | 83.3 | 8.7 |
| *Tenure Status* | | | |
| No tenure system at this institution | 14.2 | 85.8 | 15.0 |
| Not on tenure track, but this institution has a tenure system | 19.9 | 80.1 | 24.3 |
| On tenure track but not tenured | 21.3 | 78.7 | 20.0 |
| Tenured | 17.6 | 82.4 | 40.7 |
| *Gender Identity* | | | |
| Man | 16.4 | 83.6 | 42.7 |
| Woman | 20.2 | 79.8 | 51.4 |
| I prefer not to respond | 18.1 | 81.9 | 5.9 |
| *Racial/Ethnic Identification* | | | |
| Asian | 28.8 | 71.2 | 4.2 |
| Black or African American | 27.4 | 72.6 | 11.9 |
| Hispanic or Latino | 23.1 | 76.9 | 3.2 |
| White | 15.3 | 84.7 | 65.6 |
| American Indian, AK Native, Native HI, Pacific Islander, or Other | 25.0 | 75.0 | 2.0 |
| Multiracial | 15.4 | 84.6 | 3.2 |
| I prefer not to respond | 20.5 | 79.5 | 10.0 |

*continues on following page*

Table 2. Continued

| | | Flipped Course (Row %) | Traditional Course (Row %) | Total (Column %) |
|---|---|---|---|---|
| *Sexual Orientation* | | | | |
| | Straight (heterosexual) | 17.3 | 82.7 | 83.3 |
| | LGBQ+ | 25.0 | 75.0 | 5.3 |
| | I prefer not to respond | 22.9 | 77.1 | 11.5 |

Table 3. Select Course Characteristics by Flipped Classroom Status

| | | Flipped Course (Row %) | Traditional Course (Row %) | Total (Column %) |
|---|---|---|---|---|
| *Course Format* | | | | |
| | Classroom instruction on campus | 14.3 | 85.7 | 83.9 |
| | Classroom instruction at an auxiliary campus | 25.0 | 75.0 | 1.6 |
| | Distance education online | 42.9 | 57.1 | 1.7 |
| | Combination of classroom instruction and distance education | 41.5 | 58.5 | 12.8 |
| *Course Load* | | | | |
| | 0-3 courses | 17.9 | 82.1 | 19.0 |
| | 4-5 courses | 18.0 | 82.0 | 22.0 |
| | 6-7 courses | 18.0 | 82.0 | 29.7 |
| | 8 or more courses | 19.2 | 80.8 | 29.3 |
| *Class Level* | | | | |
| | Lower division | 16.1 | 83.9 | 39.3 |
| | Upper division | 20.3 | 79.7 | 53.7 |
| | Other | 14.9 | 85.1 | 7.1 |
| *Previous Experience Teaching The Course* | | | | |
| | 0 times | 18.5 | 81.5 | 7.4 |
| | 1-2 times | 24.7 | 75.3 | 13.7 |
| | 3-4 times | 19.8 | 80.2 | 13.1 |
| | 5 or more times | 16.7 | 83.3 | 65.7 |
| *General Education Requirement* | | | | |
| | Not a general education course | 18.8 | 81.2 | 55.8 |
| | Selected course meets general education requirement | 18.2 | 81.8 | 44.2 |
| *Course Size* | | | | |
| | Small (20 or fewer) | 19.0 | 81.0 | 34.9 |
| | Medium (21-30) | 17.9 | 82.1 | 33.4 |
| | Large (31 or more) | 18.6 | 81.4 | 31.7 |

### Analyses

To answer what kinds of faculty are more likely to flip courses and what types of courses are more likely to be in a flipped format, the authors computed a series of chi-square ($\chi^2$) analyses and adjusted standardized residuals. Standardized residuals greater than 2 or less than -2 were considered notable differences (Agresti & Finley, 2009). To answer the second question about what factors most strongly motivate faculty to flip their courses, the authors examined descriptives to see which of the given factors were most substantial in their decision to flip their course. Although not a focus of this investigation, the authors read qualitative responses to the "other, please specify" item under reasons faculty decided to teach a flipped course to understand the general themes that faculty were noting. To answer how much the amount of time faculty spend on teaching-related practices differ in flipped and traditional courses, the authors used *t*-tests and Cohen's *d* effect sizes to examine faculty reports of time spent on various activities between flipped versus traditional courses. To answer the final research question about how having a flipped course relates to effective educational practices, the authors used *t*-tests and Cohen's *d* effect sizes to examine faculty scores on the core FSSE Scales of effective educational practice between flipped versus traditional courses. A series of regression models using the core FSSE Scales as dependent variables followed, having a flipped course as the key independent variable, and controlling for the course and faculty demographics found to be significant in the first research question. The authors standardized variables before entry into models so that readers can interpret unstandardized coefficients as effect sizes.

### Limitations

Institutions self-select to participate in FSSE and can select their own faculty samples which may limit generalizability. Despite this self-selection, FSSE institutions and respondents mirror many characteristics of faculty and institutions across the U.S. except for fewer part-time faculty respondents in FSSE (FSSE, 2017). Additionally, faculty choose one course which they are teaching or taught during the current school year to respond to questions about their teaching practices, so these results may not represent all the courses they teach. Finally, some groups of faculty were small, such as those that identified as a gender identity other than man or woman, and the authors removed them from this study. The authors combined other groups such as those that identified as American Indian, Alaska Native, Native Hawaiian, or other Pacific Islander or faculty who identified with a sexual orientation other than straight to create larger subpopulations of faculty. Removing small groups and collapsing others may lead to results that do not apply to all subpopulations of faculty and researchers should examine this variation in future research.

## FINDINGS AND IMPLICATIONS

### What Kinds of Faculty and in What Types of Courses are More Likely to be Flipped?

Courses taught in Business fields (AR = 2.2, $p < .05$) and courses taught by full-time Lecturers or Instructors (AR = 3.0) were more likely to be flipped courses. Faculty of color, particularly Asian (AR = 2.0, $p < .01$) and Black or African American (AR = 3.0) faculty, were more likely to teach a flipped course with White faculty less likely to do so (AR = -3.7). Courses taught either in a distance education (AR = 2.9, $p < .001$) or combination of in-class instruction and distance education format (AR = 8.0) were more likely to be flipped, but courses taught in a classroom setup on campus were less likely to be flipped (AR = -8.6). Differences in the representation in flipped status were not found by faculty members' tenure status, gender identity, or sexual orientation or in a course's general education status, course size, course level, faculty course load, or faculty's previous experience in teaching the course. See Table 4 for more details on the statistically significant $\chi^2$ tests; the authors did not include non-significant tests in the table.

While many of the previous studies on flipped courses focused on math-related fields (Foertsch et al., 2002; Gannod, Burge & Helmick, 2008; Herreid & Schiller, 2013; Wilson, 2013), this study adds to the literature more broadly across disciplines. The decision to flip courses is not equal amongst types of faculty or courses. Differences by field and faculty demographics may signal the need for more interdisciplinary training and faculty development to help all kinds of faculty and faculty in different fields take part in flipped setups. Faculty developers could look to the field of Business for examples of how to flip courses. Courses taught at a distance or in hybrid formats may be easier to flip as there is likely an online component already in place. Faculty with traditional in-class setups will need further support to flip their courses. Faculty developers helping faculty with such courses should keep in mind the challenges and needs of faculty just starting their collection of online sources and materials as that will likely be the most difficult hurdle to surpass. In many aspects of course type, however, there were no differences indicating that flipped activities can be universally helpful despite the course size, course level, or faculty's previous experience teaching the course.

*Table 4. Chi-Square Statistics for Differences in Faculty Demographics and Course Characteristics by Flipped Status*

| | Standardized Residual | | *n* | *df* | $\chi^2$ sig |
|---|---|---|---|---|---|
| | **Traditional** | **Flipped** | | | |
| *Disciplinary Area* | | | 1,227 | 10 | 19.387* |
| Arts & Humanities | 0.9 | -0.9 | | | |
| Biological Sciences, Agriculture, & Natural Resources | 1.6 | -1.6 | | | |
| Physical Sciences, Mathematics, & Computer Science | 1.2 | -1.2 | | | |
| Social Sciences | 0.6 | -0.6 | | | |
| Business | -2.2 | 2.2 | | | |
| Communications, Media, & Public Relations | 1.1 | -1.1 | | | |
| Education | -1.5 | 1.5 | | | |
| Engineering | 1.5 | -1.5 | | | |
| Health Professions | -1.8 | 1.8 | | | |
| Social Service Professions | -1.4 | 1.4 | | | |
| Other disciplines | 0.9 | -0.9 | | | |

*continues on following page*

*Table 4. Continued*

| | | Standardized Residual | | *n* | *df* | $\chi^2$ sig |
|---|---|---|---|---|---|---|
| | | Traditional | Flipped | | | |
| *Academic Rank* | | | | 1,167 | 4 | 10.129* |
| | Full Professor | 1.6 | -1.6 | | | |
| | Associate Professor | -0.1 | 0.1 | | | |
| | Assistant Professor | 0.2 | -0.2 | | | |
| | Full-time Lecturer/Instructor | -3.0 | 3.0 | | | |
| | Part-time Lecturer/Instructor | 0.5 | -0.5 | | | |
| *Racial/Ethnic Identification* | | | | 1,226 | 6 | 18.747** |
| | Asian | -2.0 | 2.0 | | | |
| | Black or African American | -3.0 | 3.0 | | | |
| | Hispanic or Latino | -0.8 | 0.8 | | | |
| | White | 3.7 | -3.7 | | | |
| | Other, American Indian or AK Native, Native HI or other PI | -0.9 | 0.9 | | | |
| | Multiracial | 0.5 | -0.5 | | | |
| | I prefer not to respond | -0.7 | 0.7 | | | |
| *Course format* | | | | 1,242 | 3 | 77.016*** |
| | Classroom instruction on-campus | 8.6 | -8.6 | | | |
| | Classroom instruction at an auxiliary location | -0.8 | 0.8 | | | |
| | Distance education | -2.9 | 2.9 | | | |
| | Combination of class instruction and distance education | -8.0 | 8.0 | | | |

## What Factors Most Strongly Motivate Faculty to Flip Their Courses?

Feeling that teaching a flipped course would improve student retention of factual or procedural knowledge (M = 2.92, SD = .959; where 1=Very little and 4=Very much) or that teaching a flipped course would improve students' metacognitive skills (M = 2.84, SD = .988) were faculty's most substantial reasons for flipping their course. Moderately substantial reasons for flipping a course included wanting to address student feedback from a previously taught course (M = 2.04, SD = 1.056); needing to redesign the course due to the volume of course content (M = 2.00, SD = .987); and being influenced by their institution, department, and/or faculty peers (M = 1.78, SD = .948). Being awarded teaching grants in support of innovative curriculum design (M = 1.27, SD = .709) or feeling a need to redesign the course due to a high student-to-instructor ratio (M = 1.63, SD = .940) were factors that were least substantial. Additionally, qualitative responses for faculty motivation indicated the following inspirations: the adoption of a pedagogical practice that improves student outcomes, convenience for students in engaging with core course content, and a class structure that most appropriately fit a flipped design.

Faculty's most strong reasons for flipping their courses are student-focused indicating that faculty know such practices are good for students. Helping other faculty see the benefits of course flipping may help in motivating them to act. The immediate feedback provided to faculty in flipped courses can also help them to see the benefits to students (Herreid & Schiller, 2013). It is interesting to note that structural reasons such as high student-to-instructor ratio or needing to redesign the course due to volume of content were less substantial motivators as flipping for those reasons would seem to be practical and efficient. It does, however, give some explanation as to why this study didn't find differences by a variety of course characteristics. Given the large amount of work it would take to redesign a flipped course, it is heartening to know that faculty largely make this decision for the benefit of students. This might also explain why certain types of faculty, such as faculty of color, are more likely to put in the effort to flip their courses.

## How Does the Amount of Time Faculty Spend on Teaching-Related Practices Differ in Flipped and Traditional Courses?

Most notably, faculty with flipped courses required more time with course administration than faculty teaching traditional courses ($d$ = .44, $p$ < .001). Faculty with flipped courses spent moderately more time working to improve their teaching ($d$ = .38, $p$ < .001), grading assignments and exams ($d$ = .36, $p$ < .001), meeting with students outside of class ($d$ = .28, $p$ < .001), and time preparing class sessions ($d$ = .24, $p$ < .01) than their peers that did not teach a flipped course. There were no differences between the amount of time faculty spent actually teaching flipped and traditional courses. See more details in Table 5.

It is important to keep in mind, that flipped courses will likely take faculty more time, especially at first and most notably, in aspects of course administration (emailing students, maintaining websites, etc.) Institutions and faculty development offices interested in increasing flipped classrooms must allow and support faculty with the time and resources to make flipping courses attainable. Faculty members need the time and support to pilot new ways for students to learn (Herreid & Schiller, 2013; Roehl, Reddy & Shannon, 2013). In addition to the time to prepare, faculty who are starting out flipping their courses may need additional time to "practice" the new course format more than once to determine the success of the change. Being understanding that initial attempts to flip may be difficult and that faculty may fear innovating due to poor course evaluations or unforeseen circumstances (technological difficulties, etc.) will be necessary to create an environment that fosters a flipped course mentality.

*Table 5. Faculty Time Means and Statistics by Flipped Course Status*

| | Flipped Course | | Traditional Course | | t | Sig. | *d* |
|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | | | |
| Preparing class sessions | 9.4 | 5.44 | 8.1 | 5.13 | -3.274 | ** | .24 |
| Teaching class sessions | 10.4 | 5.10 | 9.8 | 4.65 | -1.564 | | .11 |
| Grading assignments & exams | 8.2 | 5.44 | 6.4 | 4.54 | -5.250 | *** | .36 |
| Meeting with students outside of class | 5.8 | 4.41 | 4.6 | 3.60 | -4.102 | *** | .28 |
| Course administration | 7.2 | 5.66 | 5.0 | 3.94 | -6.774 | *** | .44 |
| Working to improve your teaching | 5.9 | 5.17 | 4.2 | 3.77 | -5.802 | *** | .38 |
| Key: ** $p$ < .01, *** $p$ < .001 | | | | | | | |

### How Does Having a Flipped Course Relate to Effective Educational Practices?

In examining analyses without controls, faculty with flipped courses were more strongly intentional in having Course Goals related to student learning and development ($d = .56$, $p < .001$), emphasized more Higher-Order Learning ($d = .49$, $p < .001$), and more substantially used Effective Teaching Practices ($d = .44$, $p < .001$) than their peers teaching in a traditional format. Faculty with flipped courses encouraged more Collaborative Learning ($d = .38$, $p < .001$), more strongly valued Reflective and Integrative Learning activities ($d = .35$, $p < .001$), more strongly valued students' use of Quantitative Reasoning skills ($d = .35$, $p < .001$), and encouraged more student use of effective Learning Strategies ($d = .34$, $p < .001$) than their peers teaching in a traditional format. Still notable, faculty teaching a flipped course also more frequently participated in Student-Faculty Interaction with students outside of class ($d = .29$, $p < .001$), more strongly value increasing their institution's Supportive Environment for students ($d = .29$, $p < .001$), and provide more opportunities for Discussions with Diverse Others ($d = .28$, $p < .001$). Even when controlling for faculty academic rank or position, course format, faculty racial/ethnic identification, and faculty disciplinary appointment, faculty with flipped courses display more use of effective teaching practices in all the aspects studied here except for faculty perceptions of students' interactions with others on campus (Quality of Interactions). Although coefficients suggest a slightly smaller relationship when controlling for faculty and course characteristics, faculty with flipped courses still use more educationally beneficial pedagogies, most notably intentionally structuring their courses for learning and development (B = .375, $p < .001$), emphasizing higher-order learning skills (B = .362, $p < .001$), using clear and effective teaching pedagogies (B = .332, $p < .001$), and encouraging collaboration among peers (B = .325, $p < .001$) than their peers teaching traditional courses. See more details in Table 6

*Table 6. FSSE Scale Means and Statistics by Flipped Course Status*

| | Flipped Course | | Traditional Course | | Without Controls | | | With Controls[a] | |
|---|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | t | Sig. | *d* | B | Sig. |
| Higher-Order Learning | 47.8 | 11.35 | 41.8 | 13.14 | -6.373 | *** | .49 | .362 | *** |
| Reflective & Integrative Learning | 48.3 | 11.98 | 43.8 | 13.51 | -4.637 | *** | .35 | .223 | ** |
| Learning Strategies | 42.9 | 15.39 | 37.6 | 15.83 | -5.266 | *** | .34 | .233 | ** |
| Quantitative Reasoning | 40.1 | 17.12 | 33.5 | 19.55 | -4.628 | *** | .35 | .276 | *** |
| Collaborative Learning | 41.9 | 14.83 | 36.1 | 15.41 | -5.783 | *** | .38 | .325 | *** |
| Discussions with Diverse Others | 31.4 | 18.31 | 26.6 | 16.30 | -4.801 | *** | .28 | .186 | * |
| Student-Faculty Interaction | 40.6 | 13.35 | 36.8 | 13.08 | -3.847 | *** | .29 | .222 | ** |
| Effective Teaching Practices | 52.4 | 7.75 | 48.8 | 8.47 | -3.553 | *** | .44 | .332 | *** |
| Quality of Interactions | 38.0 | 10.86 | 36.5 | 10.15 | -1.475 | | .14 | .112 | |
| Supportive Environment | 45.9 | 11.09 | 42.7 | 10.91 | -3.179 | *** | .29 | .241 | ** |
| Course Goals | 43.0 | 11.66 | 36.4 | 12.23 | -6.668 | *** | .56 | .375 | *** |

Key: *$p < .05$ **$p < .01$, ***$p < .001$.
a. Variables were standardized before entry into models so that unstandardized B's can be interpreted as effect sizes. Controls included faculty academic rank/position, course format, faculty racial/ethnic identification, and faculty disciplinary appointment.

Aligned with the literature (Du, Fu & Wang, 2014), the study finds overwhelming evidence of the benefits of flipped classrooms. In flipped courses, faculty are providing students with more active and engaging environments, encouraging more learning with peers, using more effective teaching practices, and being more intentional in how they structure their courses for students' learning and development. It appears flippers spent substantial more energy creating clear and organized learning experiences through thoughtful construction of out-of-class and in-class activities. Alli, Rajan, and Ratliff (2016) argued that high-quality blended courses provide a unique opportunity to adapt instruction and feedback based on the individual needs of the learner, providing a more efficient and personalize learning experience. Wang and colleagues (2015) found undergraduates who experienced clear and organized instruction improved their cognitive development over four years, by using deep approaches to learning more often. It is possible the reason flipped courses benefit students is that both are happening concurrently. That is, students are benefiting from personalized learning experiences as well as clear and organized instruction. Given the large amount of value placed on student outcomes as a motivator for flipping courses, helping faculty to understand these benefits may greatly increase faculty inclination towards flipping.

## FUTURE RESEARCH DIRECTIONS

While this study provides a broad overview of flipped courses from the faculty perspective, we did not fully investigate the quality of the course itself. More research is necessary to understand what aspects of the flipped course design contributes the most to specific learning behaviors and attitudes. For example, to what extent are quizzes and assignments motivating factors for learners to consume the online lecture prior to the in-class session? Does scaffolding and retention of knowledge improve when students consistently complete the lectures and pre-work assignments? What are the most effective interactive ways to reinforce these new concepts in large, medium, and small groups? Diving into questions like these, that investigate the connection between students' metacognition and the intervention itself, will help instructors design efficient and effective learning environments. Although findings show that instructors flip because they want to improve student learning and retention of knowledge, did this actually happen because of the flip classroom design? What specific aspects of the flipped course contribute to students' success and failure? Only conducting quasi-experimental research would lead us to this answer. Future studies need to fully investigate these issues from the student and faculty perspectives.

This study also revealed how faculty distribute their time can vary greatly by teaching mode. Although time spent in-class was similar, out-of-class time preparing, grading, and improving the course was not. Future studies should explore exactly in what ways are faculty having to expend more time and energy in flipping their courses. Is it in recording videos? Then more support can go towards helping faculty create videos. Is it in grading more group projects? Perhaps faculty developers can help faculty create more efficient systems of assessing student work. Is the technology itself problematic in some way? Technology, for both faculty and students, that facilitates flipped courses is necessary for the course to be successful so instructional technology staff should be working with faculty developers to provide the necessary support. Knowing, probably in more localized contextual studies, where exactly the difficulties are for faculty flipping their courses will be essential for success. Large-scale studies or the case studies of others may be useful, but administrators and incentives should encourage faculty to study their own use of time in order to receive efficient and useful support.

Lastly, this study reveals pockets of faculty and disciplines where these future studies may occur. We typically look to tenured and tenure-track faculty as the experts in teaching methods in their respective field. However, this study shows full-time lecturers may be an untapped resource regarding innovative teaching practices like flipped course design. This study also concludes the racial/ethnic background of faculty is related to whether they taught a flipped course. This is a curious finding that should be further investigated. What about a flipped course design aligns with the pedagogical approach of some minoritized faculty? Digging deeper into the racialized experiences of faculty and their choices of teaching approaches may be another line of inquiry.

## CONCLUSION

The heightened interest in examining the flipped classroom design has been spurred on by educators seeking to utilize advancements in technology to improve student learning and meet the needs of a newer generation of students. While the bulk of research on the flipped classroom is focused on how this nontraditional approach influences student learning outcomes, this study contributes to the flipped classroom literature by analyzing this pedagogical approach from a faculty perspective. As noted within the results, this study found that variation exists across disciplinary fields and faculty demographics in instituting a flipped classroom design. The identification of this variation serves as empirical evidence for departmental leaders and administrators to take into account when strategically designing professional development initiatives that promote best teaching practices amongst all faculty members and academic disciplines.

Faculty members embracing the flipped paradigm have shown to implement the practice as a way to support students in achieving higher learning outcomes through increased comprehension of course content and more advanced cognitive skills that encourage the use of application, evaluation, and synthesis. When coupled with this finding, it is of no surprise that these same faculty members employing the use of the flipped design also more frequently engage in good educational practices as compared to their counterparts teaching in a traditional manner. More specifically, these practices include placing a higher emphasis on higher-order learning, establishing course goals, and instructional clarity. Although the results of this study suggest that the flipped design may serve as an effective teaching tool, it is important to recognize the challenges associated with teaching a flipped course.

The challenges observed within this study show that teaching a flipped course can place a heavier time burden on faculty members that have to exert extra energy on creating or compiling course materials for students to engage with prior to attending class. Although a base of research is currently forming around the flipped classroom teaching model, further research on flipped classrooms is needed to investigate what specific aspects of the flipped model contribute the most to student learning, supportive structures that aid faculty in implementing the flipped design, and possible solutions to mitigate the observed challenges of teaching a flipped course.

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## KEY TERMS AND DEFINITIONS

**Course Goals:** The anticipated outcomes faculty desire for their students such as, advance writing, numeracy, or critical thinking skills.

**Effective Teaching Practices:** The methods in which instructors organize their lessons, use descriptive examples in class, and provide students feedback for work among other indicators.

**Flipped Classroom:** A flipped course swaps traditional in-class learning with typical out-of-class learning. For instance, new information is delivered online prior to attending class while activities related to processing and applying the information are completed during class.

**FSSE:** The Faculty Survey of Student Engagement is a research instrument used to measure teaching practices of instructors at four-year colleges and universities.

**FSSE Scales:** Several scales used in analyses measuring various constructs including: Higher Order Learning, Reflective and Integrative Learning, and Effective Teaching Practices.

**Higher Order Learning:** The emphasis of course material challenging students to apply theories to practice, analyze new ideas, and form new meanings based on content.

**Reflective and Integrative Learning:** The processes by which students are encouraged to connect material to societal issues, reflect on strengths and weaknesses of arguments, and combine knowledge from other coursework.

# Chapter 21
# Technology Integration in a Modified Flipped Spiraling Curriculum:
## Reversing Roles and Rationale

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## ABSTRACT

*This chapter describes an instructional method designed to integrate technologies fostering student engagement in a course content where educators reverse the roles traditionally held by teachers and learners. To provide context for this method, it details an example course designed for the pre-service teacher to develop technology integration in their future K-12 classes. This example provides a model of the theoretical rationale that supports practical applications of technology and the reversing constructivist role of the instructors enhancing learner engagement in technology-rich learning environments. In doing so, it introduces technologies fostering learner-centered technology engagement through introducing a "modified flipped spiraling curriculum" model. Furthermore, it demonstrates the performance indicators to evaluate the course and students' achievement of objectives. Finally, it tries to depict this model for instructors, instructional designers, pre-service teachers, and educational technologists to use it as a guide to design and implement similar courses.*

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## INTRODUCTION

With the effect of technological advancement in the field of education, the traditional model of Instructivist face-to-face learning environment changed its face rapidly to more Constructivist flipped education. This rapid influence that technology has made in the teaching and learning environment needs fundamental changes in rationales, roles, and content delivery. The Modified Flipped Spiraling Curriculum Model was first designed and implemented in a technology-enhanced pre-service teacher education course in a university in the southwest of the United States to answer these needs in the field of educational technology. This course was developed to foster student engagement with technology through changes in the process of content delivery and shorten the disadvantages of traditional Instructivist rationale.

The pre-service teacher candidates who are the students of this class attend a three-credit teacher preparation Educational Technology Course (ETC). These pre-service teachers majoring in elementary education, special education, and early childhood education. They are in their last semester of coursework prior to student teaching and they meet two sessions per week. This course follows a 16-week format with seven macro-modules including introduction and overview on reflection and blog writing; classroom technology resources; thoughtful technology integration in a modified jigsaw activity; global digital citizenship; two iterations of Micro Lesson design, development, and practice teaching; and a comprehensive reflection via a digital video artifact.

The objective of this newly designed course is to foster pre-service teachers' engagement in learning by using, creating, designing, and sharing digital artifacts to construct knowledge in a Constructivist learning environment. This course is designed to use instructional strategies with more hands-on activities in a format of Spiraling curriculum.

This chapter will also provide details of how the proposed model of the Modified Flipped Spiraling was developed and how instructors and future K-12 teachers can use this model in their classrooms to foster learners' engagement with technology in a Constructivist learning environment. Furthermore, this chapter comprises of sections providing real examples of technology-based activities, apps and educational technologies, assessment types, and rubrics to be used as a manual in similar Educational Technology courses.

## THEORETICAL FRAMEWORK

### Learners' Engagement in Technology-Rich Environment

Learners' engagement as one of the main strategies to optimize their achievement has been the subject of the ample number of research in the last decades (Chickering & Gamson, 1987; Harper and Quaye, 2009). Hu and Kuh (2002) defined the learners' engagement as "the quality of effort students themselves devote to educationally purposeful activities that contribute directly to desired outcomes." (p. 555) Learners' engagement, mostly, was introduced by the emergence of Constructivism theory of learning and it, then, absorbed the attention of researchers and educators.

In Constructivism, which will be focused more later in this chapter, learning is considered as the active participation of students in their own learning process. Later, with the introduction of educational technologies in educational settings, bodies of research focused on learning with technology and students' approach while they are engaged in technology-based instruction. The results of these research studies suggest that learning with technology can successfully facilitate learners' engagement in student-centric learning environments. These research studies also indicate there is a strong relationship between learners' engagements in a technology-rich learning environment and their effective and active learning practices (Jonassen, 2003; Nelson Larid and Kuh, 2005; Kim & Reeves, 2007; Kinzie, 2010; Chen, Ouyang, Chang, & Zhou, 2018; Delaney, Kummer, & Singh, 2019) since students need to get engaged in intellectual activities when using digital tools (Gebre, Saroyan, and Bracewell, 2012; Richardson & Newby, 2006).

Learning environments coupled with the technology-rich learner-centric approach foster student engagement and, as a result, provide autonomous, independent, and self-directed learners (Gebre, et al., 2012). However, as Gebre, et al. (2012) indicated, the presence of technologies and tools does not necessarily guarantee successful engagement of students and, hence, their achievement in the course. Therefore, many other factors including the design of the course, learning activities, and what students do in their learning process play a significant role in their engagement. Consequently, there is always an increasing demand to improve the curriculum, instructional technologies, method of teaching, or, in a simple word, educational strategies. The flipped classroom is one of the strategies addressing the ever- increasing needs of learners in the digital era.

## Flipped Form of Instruction

The term "Flipped classroom" has gained popularity in recent decades due to the wide availability of technological tools outside of classrooms. This kind of instructional strategy is a type of blended learning optimizing in-class time with delivering instructional content outside of the classroom. Flipped classroom shifted the traditional didactic instruction to more personalized student-centered instruction.

Mazur (1997), the pioneer of the flipped classroom, introduced an instructional strategy called Peer Instruction (PI) in which "information transfer" was moved out of the class time through requiring students to take pre-class web-based assignments and "information assimilation" into the classroom. During class time, Mazur had enough time to scaffold and coach students instead of lecturing them. The class time was divided into a brief presentation followed by a concept testing in which students discussed the correct answer with their peers and the instructor scaffolded them in groups.

Baker (2000), for the first time, used the term "flipped" associated with a model of teaching in which some parts of instruction are moved out of the class time through educational technologies such as online collaborative tools or video conferencing. In his model, flipped classroom focused on a student-centric atmosphere with moving the information transfer to out-of-the-class time and knowledge construction during-the-class time.

Later, Lage, Platt, and Treglia (2000) conducted a research study focusing on a lecture-based traditional classroom vs. a flipped classroom with materials presented out of the class via technological tools like computers or VCRs to meet the variety of the students' learning styles. Resources were also provided for students to gain knowledge of the subject prior to the class; i.e. textbook reading, videos, and PowerPoint presentations. Finally, they found out that both students' and instructors' perception was more positive with higher motivation to learn materials in the flipped form of instruction than traditional modeling of instruction.

Khan (2001), the founder of Khan Academy, was another recognizable contributor in expanding the flipped form of instruction through providing recorded videos of learning materials. He expanded this idea by designing an online academy through which students could get access to online videos to foster their learning out of the class and formal instruction.

By the progress of this form of instruction, various definitions of the flipped classroom were introduced. For example, Educause defined a flipped classroom as "a pedagogical model in which the typical lecture and homework elements of a course are reversed […]. There is no single model and the term is widely used to describe almost any class structure that provides pre-recorded lectures followed by in-class exercises." (Educause, 2012, p. 1) Knewton (2016), also, modified the definition of the flipped classroom as the "traditional teaching methods, delivering instruction online outside of the class, and moving "homework" into the classroom." (p. 1)

The flipped classroom is a pedagogical approach in which indirect instruction and scaffolding are substituted instructors' lectures to maximize in-class time to engage students in hands-on creative activities to construct knowledge. In this model, technology assists instructors to move material presentation, concept introduction, structured learning guide, and also learning reflection to out of class time. This model focuses on using in-class time to the best advantage for engaging students in their own learning. In the flipped-form of the classroom, students have access to course contents and they have more time to review and practice materials in advance and ask possible problems in face-to-face sessions. Then, Instructors, also, provide more creative personal instructions and scaffolding appropriate for students with different learning styles.

Arnold-Garza (2014) mentioned some strength of the flipped classroom as "efficient use of classroom, more active learning opportunities for students, increased one-on-one interaction between student and teacher, student responsibility for learning, and addressing multiple learning styles." (p. 8) In this form of instruction, students use a combination of technology-based learning materials in and out of class to construct knowledge with seeking help or through tackling difficult problems, working in groups, doing research, and/or working as individual independent learners (Bennett, Spencer, Bergmann, Cockrum, Musallam, Sams, Fisch, & Overmyer, 2013). Also, flipping a class can result in large learning gains and positive learners' attitudes towards the learning process" (Stone, 2012, p.3), however, structuring such a disparate learning and teaching environment can be cumbersome (Roehl, Reddy, & Shannon, 2013).

## Limitations of the Flipped Classroom

Similar to any new advancements, the flipped form of instruction has brought some shortcomings including lack of students' access to the internet or technological devices at home, different learning preferences, difficulty in learning through online videos or from screens, lack of learning autonomy, and high demand of quality time to prepare out-of-class materials. Furthermore, teachers have a huge responsibility since they need to provide a vast array of higher-order thinking tasks and alternative tools to allow active learning suitable for highly differentiated instruction. Higher-order thinking tasks might include problem-finding, collaboration, design, and problem-solving (Bergmann & Sams, 2012). In a traditional flipped classroom, most of the class time is specified to the lecture-based instruction. Therefore, this traditional model is more teacher-centric with the aim of presenting materials and tools to students. Then, students read materials and prepare assignments before the class and post or upload them on their online course shell. This might increase the transactional distance (Moore & Kearsley, 1996) which is the psychological and communications space between teachers and students. Therefore, there is not enough one-to-one scaffolding in the traditional flipped class. To decrease these pitfalls of the flipped classroom and to support learners' engagement and scaffolding during class time, the "modified flipped model" was introduced which will be discussed in detail below.

## Modified Flipped Classroom

The modified model of the flipped classroom is introduced to decrease the shortcomings of the traditional models. The main aim of the modified flipped model of instruction is to prepare future teachers (pre-service teachers) to integrate technology using a student-centered learning environment where their future students would use digital tools to construct knowledge aligned to National standards while constructing digital artifacts. To support this model, instructors use an online course management system to present materials, grades, announcements for students, such as Blackboard course shell which acts as a conduit and interactive communication venue between instructors and students. There are also some free online course shells (like Moodle) that instructors can use if their corresponding university does not provide any online course management systems.

The modified flipped classroom is designed in three phases: before class, in class, and after class. Before the class-time, the instructors prepare an online platform for one-to-one or group communication through an online course management system (Blackboard, Moodle), online communication tools (Google Hangout, Collaborate Ultra), and structured guided materials (content, resources, technologies, instructions). Unlike the traditional flipped classrooms, students in this model are not required to self-study and read the materials before the class. Also, during in-class time. instructors do not directly teach or present lectures on how to use specific technological tools. However, the only direct lecture given by instructors is a brief introduction of the outcome students are expected to achieve at the end of each session.

In the modified flipped classroom, students learn to choose autonomously their own pathway, tools, and strategies to gain the expected outcomes lectured by instructors. In this model, students, furthermore, have the opportunity to reflect on their own learning, deepen their content understanding, and further their skills development via using some technological tools provided after class-time. Some of these technological tools are discussed in details further in this chapter.

# CONSTRUCTIVIST PERSPECTIVE OF TECHNOLOGY IN THE MODIFIED FLIPPED CLASSROOM

Different theories of learning have been introduced and implemented during decades to justify and explain how to teach a class with the application of different forms of learning models, curricula, instructions, tools, and strategies. In the current technology era with the advancement of educational technologies, the perspectives towards the theories of learning enormously affect the rationale to choose and integrate digital technologies in learning environments such as K-12 classrooms.

One of the traditional learning theories still observed and implemented in many technology-enhanced classrooms is “Instructivism”. “Instructivism” argues that learning happens as the result of repetition, rote memorization, and drill exercises. In this approach, instructors are the center of the classroom who teach materials directly from simple to complex and control the type of materials used (Anderson & Dron, 2011; Aydemir, Özkeskin, & Akkurt, 2015; Daniel, 1996). In technology-integrated courses with the Instructivism perspective, instructors use a more traditional lecture-based design to teach specific technology skills or applications and present how to use various materials, tools, and technologies. Students, also, in return, prepare for learning prior to the class through doing assignments and reading materials.

On the other hand, "Constructivism", as another theory of learning, looks at the role of learners in their learning process and knowledge construction upon prior knowledge. Constructivism considers learning as the active construction of knowledge through engaging students in authentic and collaborative activities (Zhao & Kuh, 2004; Krause & Coates, 2008; Lutz & Culver, 2010). This pedagogy focuses on the interaction among participants and not a rote transmission of knowledge from the instructor to the student (Anderson & Dron, 2011; Aydemir, Özkeskin, & Akkurt, 2015). A major emphasis of a Constructivist technology-rich classroom is "contextualized learning" in which students are given opportunities to create an artifact with integrating digital tools while they explore new information, examine new ideas, practice new skills, and present their digital artifact. In this model, learning is more discovery of knowledge rather than didactic instructive one (Tapscott, 1998).

The modified flipped classroom is designed from a learner-centered Constructivist perspective where instructors give freedom to students in order to learn with technology rather than learning about technology (Jonassen, Howland, Moore, & Marra, 2003). This perspective somewhat reverses the roles of the pre-service teachers and the course instructors in this class compared to the Instructivist perspective employed in similar technology-based teacher education courses. In this model, the basic and foundational information is presented by the instructors at the beginning of the class session. Then, the pre-service teachers take on the responsibility of building their knowledge while engaging in resources and technological tools provided for them based on the content and objective of each module. Indeed, most of the in-class time is specified to engage students in small groups to work with the available resources to gain the pre-defined objectives. In this way, the pre-service teachers dig deeply into concepts while positive feedback and constructive scaffolding are provided in groups or individually for them. In return, they show their confidence in learning the materials and how they construct their subject-matter knowledge by creating digital artifacts or designing and teaching a lesson.

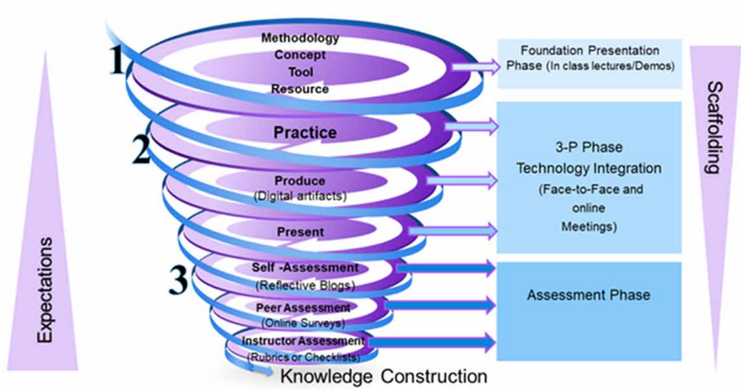
Another Constructivist perspective of technology in the modified model of the flipped classroom is the homework part which is moved into the class. The pre-service teachers work on their post-lesson technology-enhanced activities (such as reflective blogs) during the class time to reinforce their knowledge construction. In this way, they receive instant feedback from the instructor while they are assessed at the same time.

In this class model, the pre-service teachers, also, are trained to be the teacher of their own learning and learn to construct digital knowledge while working with the concepts and subject-matters which can be applied to their future K-12 classrooms. They also actively participate in their own learning to "use technology tools to explore concepts, gather data, test hypotheses, and publish or share findings, thereby, constructing their understanding." (Blocher, 2016, p. 9) In other words, the primary rationale of this model of instruction is to develop successful lifelong digital-learner teachers in a learner-centered Constructivist learning environment.

## Spiraling Curriculum of the Modified Flipped Classroom

The curriculum model employed in the modified flipped classroom is called "Spiraling". In this curriculum, the main attention of the instructors is devoted to learners' engagement with digital tools and one-to-one scaffolding. Figure 1 depicts the "Spiraling" model in the modified flipped classroom. In this spiraling curriculum, the pre-service teachers gain more mastery and skill in designing technology supported artifacts (like developing a digital integrated lesson and teaching it) during the semester. Throughout the course, technology tools are integrated into the curriculum in a *spiraling fashion*, meaning that the

*Figure 1. Modified flipped spiraling model of instruction*




pre-service teachers' understandings of and skills with various technology tools grow as they are visited and re-visited during the course. For example, basic technologies are simply introduced at the beginning at a somewhat cursory level while the pre-service teachers are given individual scaffolding. Then as the course evolves, the pre-service teachers are given more complex tasks and introduced to more robust technology tools. As the pre-service teachers progress, they are provided with less supportive scaffolding and the expectations for their level of technology expertise grow.

The spiraling curriculum consists of three phases. In the first phase, i.e., *foundation presentation*, the instructors introduce the content, concepts, methodology, tools, strategies, and the expected outcomes in a brief lecture or teaching demonstration. In this phase, which is a part of the face-to-face meeting, the pre-service teachers are introduced with the technological foundation they need to construct their knowledge based on that. The pre-service teachers have access to the online structured learning guide, provided for them in their online course management system by the instructors, to engage in the personalized learning, independent exploration, cooperative learning, and accommodation and/or assimilation of their background knowledge (Liu, Blocher, Armfield, & Moore, 2017).

In the *technology integration* part of this model (3P phase), the pre-service teachers *practice* to construct a new cognitive structure (For example, Global Digital Citizenship), *produce* a digital artifact representing that cognitive structure (For example, creating a scenario demonstrating elements of GDC via a storytelling app), and *present* their findings or final artifacts in small groups or to the whole class. The instructors, meanwhile, provide individual or small group scaffolding and personalized instructions and guidance during the class.

In the final phase, i.e., *assessment*, the pre-service teachers' content understanding and skill development are evaluated through the assessment instruments (i.e. rubric or checklist), self- assessment (i.e. writing reflective blog posts), or peer assessment (i.e. creating online survey) tools. These different kinds of assessments would be used to assess the pre-service teachers' achievement of an identified lesson objective (formative assessment) or the whole course outcome (summative assessment) individually (individual assessment) or within their groups (collaborative assessment). A detailed explanation of different kinds of assessments in the modified flipped spiraling classroom will be discussed in the "Assessment Section" in this chapter.

## Practical Examples of the Spiraling Curriculum

In the spiraling curriculum, as the semester progresses and the pre-service teachers gain a better understanding of the complex contents, the expectations to create professional artifacts in a more learner-centric environment increases while the amount of individual or group scaffolding decreases. In this model, the pre-service teachers explore new information, detect creative ways, share new information, and create digital artifacts according to the objectives of the lessons and ISTE standards before, in, and out of the class. In doing so, they learn to independently integrate technology into K-12 contents as the instructors provide individual or group scaffolding to enlighten the way in which learners' engagement in the learning process is traveling. By monitoring diligently every single step that the pre-service teachers take, the instructors can apply the learner-centric Constructivist perspective through indirect instruction and directed learning. All these phases are continuously applied and observed in all seven modules of this curriculum leading to growing independent lifelong digital citizen learners through the end of the semester.

To demonstrate clearly the spiraling curriculum, some of the technology-enhanced activities most aptly describe the modified flipped spiraling model will be explained here, i.e., the Modified Jigsaw Activity (Aronson, 2011) and Micro Lesson Teaching.

## Modified Jigsaw Activity

The aim of this activity is to teach ISTE (International Society for Technology in Education) Educators' and Students' Standards and their corresponding indicators. In the modified jigsaw activity, the instructors first introduce and model a teaching strategy to teach what ISTE standards are and how students can operationalize them in a real K-12 classroom setting (Blocher, Armfield, & Harati, 2018). Then, the pre-service teachers are grouped in teams to review, discuss, and develop examples of what ISTE standards and indicators might look like in practice. Afterward, they do short research in their groups and present their findings to the class for discussion. During the discussion time, the examples of meeting each standard are examined, meanwhile, additional examples are presented by the rest of the class.

For this activity, the pre-service teachers are required to observe the ISTE standards in a K-12 classroom in their practicum time to gain a better understanding of how these standards work within the context of the classroom. Specifically, they are asked to a) describe how K-12 students are using the technology in the classroom, b) identify which ISTE Student Standards are being covered by the use of technology in the class, c) describe why they believe that specific activity is a demonstration of ISTE standards, and d) discuss how the teacher might be meeting the ISTE Educator Standards (Blocher, et al., 2018). This reflection on their classroom observations helps the pre-service teachers to understand the nature of ISTE standards and to operationalize them in their future K-12 classrooms. Furthermore, this activity is designed to prepare the pre-service teachers to better understand the expectations of the next activity, i.e., the Micro Lesson Teaching, where they design, develop, and practice teaching a technology integrated lesson.

## Micro-Lesson Teaching

The previous bodies of research indicated that student teachers' lack of direct teaching experiences limited them in effectively using or integrating technology into teaching (Chai, Koh, & Tsai, 2010). To solve this problem, Micro-Lesson teaching practice is designed within the Constructivist perspective in this course example where the pre-service teachers develop and teach a micro-lesson in a real situation and integrate different instructional technologies. This teaching practice provides the context of and models a real classroom situation where instructors are more likely to be a coach to guide and provide feedback and suggestions (Blocher, 2016, p.19) In doing so, these pre-service teachers do not only learn how to teach but they act as a real teacher and practice what classroom teachers do in a daily-basis with the help of technology (Lui, et al., 2017).

In short, in the micro-lesson activity, instructors, first, demonstrate a technology-integrated teaching model and a detailed lesson plan representing the ISTE standards objectives/strands, assessments, rubrics, and digital artifacts. Furthermore, they model instructional strategies that the pre-service teachers can then use in creating their own lessons. As mentioned earlier, in return, the pre-service teachers are required to integrate technology to support the ISTE Standards based on the presented model. In doing so, they strive to design a lesson that promotes students' engagement with technology, besides, they develop an artifact which demonstrates the understanding of the content.

# TECHNOLOGICAL TOOLS FACILITATING LEARNERS' ENGAGEMENT IN THE MODIFIED FLIPPLED

## Spiraling Classroom

The course example in this chapter demonstrates a model of the Constructivist modified flipped spiraling curriculum in which instructors provide the opportunity for the pre-service teachers to learn new technologies while they focus on exploring new concepts, creating new artifacts, delving into unknown materials, publishing materials, communicating with peers, sharing their knowledge, and visualizing their learning experience. Instructors of the course should be meticulous to select tools and strategies at the right time and the right place to assist the pre-service teachers on their way to learn and explore concepts with the integration of technology to boost their ability to use those skills in their future K-12 classrooms. Some of these useful and free-to-access technologies and applications which can be used by instructors in similar courses are introduced in the following section.

### Type I and II Applications

Maddux, Johnson, and Willis (2001) defined Type I applications as those software programs that can be used the same way several times and Type II as the applications which enable a new and creative way of teaching and learning. In the modified model of spiraling curriculum, the instructors mostly use Type II applications, however, Type I applications (such as tutorials, Microsoft word, & drill and practice) are also used in some rare occasions. Type II applications are used in the Constructivist perspective where the technology is to help learners to build or enhance their knowledge (Blocher, 2016). These applications provide a more creative learning environment for students, but it might be challenging for instructors to find and use the proper ones (Maddux & Johnson, 2005). The following provides some of these Type II applications.

1. **Video Creation Tools:** The "video creation tool" is a Type II application used in this course. The pre-service teachers use a variety of video creation tools and online programs such as Vodcasts, Apple's iMovie (2015), Windows Movie Maker (2015), and WeVideo.com (2019). These applications are very user-friendly with the ability to upload, edit, or merge video clips and images; add sounds or music; and organize information or write narrations (Blocher, 2016). As a signature assignment, the pre-service teachers should create a video demonstrating their understanding of the course objectives (including philosophy of education, ISTE standards and indicators, application of ISTE standards in micro-lesson practices, etc.) with one of these tools.
2. **Google Classroom:** Another Type II application is Google Classroom (Google Apps, 2019). This Type II application is usually provided by the corresponding university. Here, the instructors create a Google Classroom for each individual with full access to its properties. Then, the pre-service teachers explore this online learning environment to create an online course shell for their micro-lesson teaching practice. Therefore, they learn to upload the materials, assessments, or rubrics and practice how to teach a flipped formed of a classroom with Google Classroom.
3. **Google Apps:** While creating collaborative digital artifacts or sharing research findings and/or teaching materials, the pre-service teachers can use different apps of Google. These Type II applications include google docs, slides, spreadsheet, and drawing which are free, easily accessible, and very user-friendly tools.

## Digital Scenario Tools

Creative scenario-based activities boost critical thinking and project-based learning (Blocher, 2016). Scenarios could place students in a situation to investigate different aspects of a problem, explore various techniques to solve the problem, make decisions, and create a final project. In the modified flipped spiraling model, the pre-service teachers learn about different elements of Global Digital Citizenship (GDC) through taking the responsibility to do research on various elements of GDC. After learning completely about this concept and its corresponding elements, they develop a scenario that demonstrates GDC issues in a plausible real-life situation. Then, they discuss how those issues could have been avoided or reduced. Afterward, they use different Digital Scenario tools such as Digital Storytelling to publish and present their scenarios. Digital storytelling is a tool used in scenario-based activities providing an opportunity for students to create a portfolio demonstrating their understanding of a concept and reflect upon their learning experiences. To publish and present their scenarios, the pre-service teachers also can use a variety of apps such as Google Sites, Prezi, or Mind Mapping Tools. Instructors can also provide some examples of online resources on how to integrate scenarios into the classroom such as Scenario-Based Learning, How to Engage Learners with Scenario-Based Learning, and Ways to Use Scenarios.

### Simulation Tools

"Simulations are virtual settings that allow students to explore and try out ideas, concepts, and skills that might otherwise be too expensive or possibly dangerous" (Blocher, 2016, p.102). Virtual Reality (VR) is one of the simulation tools in the modified flipped spiraling classroom. VR refers to the use of an entirely synthetic environment which is fully immersive. VR can be used to provide students with an experience that replicates reality without the risks associated with an actual experience (McKalin, 2014). One VR tool is Google's new Tour Creator (Tour Creator, 2019), which allows users to easily create VR tours using their own 360 videos or embedding Google Street View scenes. VR tools eliminate the shortage of inaccessibility to the target population, real objects, or physical settings. The pre-service teachers in this course example use VR to practice their teaching skills in classrooms filled with virtual students. VR allows them to experience new environments virtually outside of their real classroom through various educational subjects. It also helps them gain a more accurate understanding of real-life situations and new concepts.

## ASSESSMENT IN THE MODIFIED FLIPPED SPIRALING CURRICULUM

The modified flipped spiraling classroom provides a new model of instruction for instructors teaching educational technology courses or those who would like to teach students how to get engaged in technology-enhanced learning environments. Therefore, there should be also a guideline to assess students' achievement and technology integration skills in short and long terms aligned to the performance indicators outlined in the academic standards. In this section, different types and instruments of assessment to measure pre-service teachers' performance will be introduced.

### Types of Assessment

In this course model, the pre-service teachers are evaluated and assessed while they are engaged in different activities. The assessments in this class are more like hands-on activities which create a hassle-free assessment environment. Different types of assessments used in this course are the combination of Collaborative vs. Individual and Summative vs. Formative.

#### Collaborative vs. Individual Assessment

Collaborative learning is a factor in the Constructivist model of instruction which enhances critical thinking (Gulikers, Biemans, Wesselink, & Vander Wel, 1995), brings more effective and efficient outcomes (Swan, Shen, & Hiltz, 2006), and elicits conceptual understanding through social interaction within and among groups of students (Sunga & David, 2016). The course model demonstrated in this chapter is full of collaborative learning activities requiring the instructors to design a systematic *collaborative assessment* to measure the pre-service teachers' achievement in collaborative activities. In the collaborative type of assessment, the instructors consider positive interdependence of teammates to assess the amount of group accountability in teamwork activities. On the other hand, *individual assessment* is to evaluate the individual achievement of each pre-service teacher based on the performance indicators and rubrics. This assessment can range from individual accountability in a team-work activity to an individual score in a content-based activity.

### Formative vs. Summative Assessments

*Formative assessment* during the semester facilitates learning and informs the instructors in a routine-basis when the pre-service teachers need help or scaffolding. The instructors make adjustments in the syllabus based on pre-service teachers' performance on formative assessments. Formative assessment is more considered as the measurement of in-class conditions. However, *summative assessment,* instead, is the report of pre-service teachers' general learning at the end of the course, semester, or grade level. The summative assessment should be in-line with class syllabus, objectives, and performance indicators.

## Instruments of Assessment

In order to grade and score the pre-service teachers' skills, knowledge, and understandings of technology integration into the course content, the assessment criteria are designed from a multi-faceted perspective. The assessment criteria in this course example contain well-designed rubrics in addition to self and peer assessments. These provide a model for the pre-service teachers, who, then, in turn, create their own assessment criteria for their prospective students in their lesson designs.

### Rubrics

Rubrics are a set of criteria which describe the level of students' performance and achievement, quality of assignments, and course objective requirements. Therefore, the rubrics are informative for instructors and students through involving them to evaluate their digital artifacts. The rubrics in the modified flipped spiraling course are designed based on the ISTE and Arizona State standards as well as the university course evaluation forms. These rubrics contain three essential features including the criteria to complete the assignments (the level at which students' work meets the expectations), markers of quality (what

*Table 1. Four types of assessment in the modified flipped spiraling classroom*

| | **Formative Assessment** | **Summative Assessment** |
|---|---|---|
| **Collaborative Assessment** | How well students collaborate within their groups in a single team-work activity.<br>*Ex. Write up a collaborative report or drawing a mind-map about planning, processing, finding, and analyzing the elements of Digital Global Citizenship.* | Summation report of collaborative achievement of groups at the end of the course<br>*Ex. Fill out a Google Form in groups designed to assess pre-service teachers engaging with technology at the end of the semester which intends groups to report their experiment data.* |
| **Individual Assessment** | How well a student performs in a single individual task/activity.<br>*Ex. writing a blog that outlines individual experience being a global digital citizen.* | The overall achievement of a student at the end of the semester in a comprehensive exam or a signature assignment and/or a cumulative grade of all scores in every single activity during the semester based on the class performance indicators.<br>*Ex. Creating a video clip representing the materials learned during the semester.* |

must be done to demonstrate a certain level of mastery, understanding, and proficiency), and scoring (1 as approaches to 3 as exceeds). The rubrics are shared with the pre-service teachers at the beginning of the semester to effectively communicate the course expectations with them. Therefore, they can use rubrics to self-assess or give peer-feedback, besides, they reflect upon their digital products and keep track of their learning progress (Appendices I & II contain a sample of technology integrated rubrics).

## Reflective Blogs

Blogs are used by both pre-service teachers and instructors in the modified flipped spiraling course. Blogs (www.blogger.com) are used by the pre-service teachers as a reflective self-assessment tool for meeting the course objectives in design, development, and implementation of their technology-enhanced lessons.

The pre-service teachers post their reflection as pre and post blogs with their thoughts on how well their lesson development (pre-reflection) and teaching implementation (post-reflection) goes. Their blog also includes artifacts (for instance, screenshots of a geometry activity) that their peer students create during their practice teaching. The goal of this pre-post reflective self-assessment activity is to practice the reflective behavior of a classroom teacher. As the pre-service teachers blog during the development and after the implementation stages of each lesson, they need to describe how they plan, implement, and assess the learning/teaching experience and how each of these impacts what their peer students may learn from their lesson. This reflective self-assessment activity is meant to help them reflect on what they do as a teacher and to predict modifications for future teaching experiences.

The instructors of this model course also use pre and post reflective blogs for the assessment of each pre-service teacher's achievement of the course objectives. The instructors read the blogs and give comment on every step each pre-service teacher has taken in his/her teaching practice. They also magnify the strengths and mention the weaknesses and provide scaffolding on how s/he can improve different parts of their teaching practice or technology integration.

## Online Survey

The pre-service teachers create an online survey in Google Forms for a peer assessment tool. They develop this survey in order to elicit feedback and reflection from their peer student teachers about their teaching practices. The surveys should be developed based on the assessment rubrics provided in the course (Appendix II). The survey should also contain questions about different steps of their teaching practices including preparation (ex.: What could I have done to be better prepared), content (ex.: How was I successful in supporting students in learning content), individual needs (How was I successful in supporting the individual needs of students?), and technology integration (How was I successful integrating technology to support student learning of content?). The survey is then reviewed and used by the pre-service teachers as another piece of data to inform them about their teaching practice through the eyes of other peer student teachers as they write their post teaching self-reflection blog. Furthermore, this process provides the peer student teachers with the opportunity to think critically about the teaching practices they observe in their modified flipped spiraling course.

## SUMMARY

This chapter demonstrates an example of a modified technology-integrated flipped course with a spiraling curriculum, named Modified Flipped Spiraling Classroom. The rationale of this course is to reverse the role of the instructor from a lecturer to a constructivist scaffolder who designs the online and in-class structured guide, presents fundamental course concepts, engages students in small learning groups, checks for individual and whole class understanding, provides individual counseling and group feedback, and adjusts the scope and sequence of the course depending upon students' achievement. The pre-service teachers, then, as the new generation of educators, should learn this constructivist model of the instruction and construct the knowledge and skills of the 21st century (that is, digital literacy). They should learn to be digital lifelong-learners and could apply this knowledge in their future K-12 classrooms. In other words, this course example introduces the reversing of the instructivist rationale and student-teacher roles to a more Constructivist learner-centered rationale with the aim of constructing digital lifelong-learner teachers for future K-12 classrooms.

This modified flipped, project-based, spiraling, well-scaffolded, and technology-integrated model requires a deep understanding of concepts and foundation of design, development, teaching, and students' assessment with observing National and State standards. This new model is effective and engaging, with optimizing in-class time to get more help to solve complex technology-integrated problems. Technology is also embedded in all class instructions and activities as a tool to reinforce the course rationale. For instance, the pre-service teachers learn to create and use Google Forms indirectly through being asked to collect electronically the peer reflection data about their teaching implementation while they are visited, revisited, and scaffolded constantly by the instructors. This course example provides a practical model for instructors in higher teacher education courses including theory, curriculum, technological tool, and assessment to reverse their teaching model to a modified flipped one with the spiraling curriculum. In doing so, some real instances of technological collaborative tools are introduced in a constructivist model of the flipped classroom. These are some effective tools and general applications which instructors can use in educational technology courses to engage students in state-of-art digital-based activities. Most of the tools mentioned in this chapter are free of charge and accessible online. Instructors can modify their curriculum to use any of these tools to save in-class time, increase students' involvement in technology-driven activities, enhance their ability to explore different technologies, teach them complex contents, and develop their technological skills.

The example model of the flipped classroom, also, intends to best support students' engagement in a technology-rich learning environment by the spiraling curriculum. In this curriculum model, the pre-service teachers are provided with various situations to explore, get engaged, implement, and test educational technologies in project-based spiraling activities. The pre-service teachers receive substantial scaffolding at the beginning when a new concept and foundation of technology integration are introduced. Besides, as the semester progresses and students gain a better understanding of the complex content, scaffolding reduces as the expectation to do the tasks autonomously increases.

While students design and develop their lessons the instructors provide scaffolding during daily individual or small group conferences where various discipline standards, objectives, and methods are discussed. During these conferences, the pre-service teachers are encouraged to think about new technologies they could explore that might support a more Constructivist approach as they design their lessons. Once students post their lesson plans and assessment criteria online in their self-reflection blog they took turns practice teaching each other in small groups. The instructor and fellow students, then, provide feedback on how well their lesson went. Finally, students post a post-lesson reflection (as a post reflection blog) with their thoughts on how well the lesson went including artifacts that their peers (i.e. screenshots of an eBook on Mammals) created during their practice teaching.

This design and the spiraling curriculum are not complete without assessing the students and course objective achievement. This chapter also demonstrates different forms of assessments including formative collaborative, summative collaborative, formative individual, and summative individual. Instructors in educational technology courses can use the examples mentioned here to assess students' technological skill development and knowledge construction during and at the end of the semester. Also, some of the rubrics and self-assessment tools are brought here for instructors and instructional designers who want to develop or modify their technology-integrated courses to use this model as a manual and guide.

## DISCUSSION

The literacy in the 21st Century is defined as the knowledge to use computers and digital tools in everyday activities. Therefore, it is important for educators in order to internalize this knowledge in the future generation's mind. As Bransford, Brown & Cocking (2000) argued, the learning environment influences the extent of student engagement, therefore, the more creative technology-based and innovative learning environment would result in more learners' engagement. In doing so, instructors should know how to integrate instructional technologies into their teaching practices in ways to foster learners' engagement with technology. However, this may mean that traditional methods must also be changed to best facilitate the integration of these new tools and create an innovative technology-rich learning environment. Also, new and practical models of the curriculum should be introduced to flip the traditional roles of learners and teachers in which learners take control of their learning as they improve their digital knowledge and skills. Moreover, providing a hassle-free environment for students to reflect upon their own and also their peers' active learning during the semester would increase their engagement. Therefore, reflective activities such as blog writing would increase the students' engagement with their learning which will result in developing independent and autonomous learners (Jimoyiannis, 2010).

Classroom teaching can be a very complex task that requires teachers to gain the knowledge of "technology, pedagogy, content, educational context, and their interrelations." (Jimoyiannis, 2010, p.9) Consequently, it is very complex to design a course integrating technology in the content of teacher education pedagogy in a contextualized learning environment where learners are engaged to use digital tools to construct knowledge through creating digital artifacts. Therefore, educators might need course models (like this course example) to act as a manual and provide them with useful and easy-to-use instructions, examples, and ideas to design such a technology-enhanced course and implement it in higher or K-12 education.

Furthermore, the flipped form of classroom increases the level of interaction (Blair, 2012) between the instructors and pre-service teachers with devoting most of the class time to indirect instruction instead of lectures and focusing on engaging collaborative activities such as Modified Jigsaw or Micro-Lesson teaching practice. Moreover, it is clear that many of the educational technology classes incorporate Instructivist perspective in which technology is used "as a tool for word processing or information retrieval instead of incorporating technology to support inquiry that promotes students' deeper conceptual understanding of scientific ideas." (Tanak, 2018, p. 6) However, there is a need to use a model introducing many innovative ways to build a Constructivist perspective in a technology-enhanced classroom. The modified flipped spiraling classroom, for sure, could follow this path. The evidence for this claim is the data gathered from the pre-service teachers' evaluation forms (administered at the end of each semester). This data, to the date of publication of this chapter, has provided evidence that the pre-service teachers feel this modified flipped spiraling course is effective, engaging, and provides them with opportunities to learn complex technological-integrated contents while they are engaged in hands-on, learner-center, and constructivist activities.

As Blair (2012) indicated students in flipped classrooms experience more innovative and cooperation in learning compared to traditional classrooms. In this example course, also, students not only experience more cooperative and collaborative activities but also they practice different higher-order thinking tasks including design (i.e., developing a micro-lesson), problem-finding (i.e., find the elements of Global Digital Citizenship in provided scenarios), and problem-solving (i.e., how to integrate provided specific technologies and resources in content-based activities).

In addition, while designing lessons where learners use digital tools to create artifacts can be motivating and help demonstrate 21st Century skills, to have learners demonstrate achievement of State or National academic standards also requires an understanding of the objectives and concepts being taught and how learners might use technologies to support learning and assessment in a contextual manner. The authors believe this course model can be used as a guide to answer this need. Also, this course example is introduced as a guide for those in-charge who would like to design similar courses with the aim of fostering student engagement in technology-rich learning environments.

Besides, while the example provided in this chapter focuses on pre-service teachers, it is the authors' hope that current teachers, not only at schools but also universities, private institutes, community colleges, etc., would utilize this model to provide technology-rich learning environments in various content areas to foster learner engagement that best supports achieving course-specific learning outcomes while engaging in lifelong digital learning. In addition, instructor in traditional lecture-based instructions might not be aware of students' progress until administering summative testing at the end of the semester (Roehl, et al., 2013). But offering various kinds of individual and collaborative assessments during a semester provides more insights for the instructors to understand the level of students' understanding and achievement before it gets too late.

In conclusion, designing lessons that integrate technology in a student-centered manner requires teachers to have a deep foundation and understanding of how digital tools can support and enhance lessons. Therefore, there is an urgent need to incorporate faculty development programs in educational settings for educators to learn how to design and implement similar courses for different educational levels and different subject-matters.

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## APPENDIX I

*Table 2. Sample of Instructors' Assessment Rubrics*

| | 1 = Approaches | 2 = Meets | 3 = Exceeds |
|---|---|---|---|
| **Standard 1: Learner**<br>**Educators continually improve their practice by learning from and with others and exploring proven and promising practices that leverage technology to improve student learning.**<br>1a: Set professional learning goals to explore and apply pedagogical approaches made possible by technology and reflect on their effectiveness.<br>1b: Pursue professional interests by creating and actively participating in local and global learning networks.<br>1c: Stay current with research that supports improved student learning outcomes, including findings from the learning sciences. | 0 (0%) - 4.48 (8.97%)<br>The candidate demonstrated little improvement of their practice by learning from and with others and exploring proven and promising practices that leverage technology to improve student learning. | 4.55 (9.1%) - 5.78 (11.57%)<br>The candidate demonstrated some improvement of their practice by learning from and with others and exploring proven and promising practices that leverage technology to improve student learning. | 5.85 (11.7%) - 6.5 (13%)<br>The candidate continually improves their practice by learning from and with others and exploring proven and promising practices that leverage technology to improve student learning. |
| **Standard 2: Leader**<br>**Educators seek out opportunities for leadership to support student empowerment and success and to improve teaching and learning.**<br>2a: Shape, advance and accelerate a shared vision for empowered learning with technology by engaging with education stakeholders.<br>2b: Advocate for equitable access to educational technology, digital content and learning opportunities to meet the diverse needs of all students.<br>2c: Model for colleagues the identification, exploration, evaluation, curation and adoption of new digital resources and tools for learning. | 0 (0%) - 4.48 (8.97%)<br>The candidate did little to seek out opportunities for leadership to support student empowerment and success and to improve teaching and learning. | 4.55 (9.1%) - 5.78 (11.57%)<br>The candidate sought out an opportunity for leadership to support student empowerment and success and to improve teaching and learning. | 5.85 (11.7%) - 6.5 (13%)<br>The candidate seeks out opportunities for leadership to support student empowerment and success and to improve teaching and learning. |
| **Standard 3: Citizen**<br>**Educators inspire students to positively contribute to and responsibly participate in the digital world.**<br>3a: Create experiences for learners to make positive, socially responsible contributions and exhibit empathetic behavior online that build relationships and community.<br>3b: Establish a learning culture that promotes curiosity and critical examination of online resources and fosters digital literacy and media fluency.<br>3c: Mentor students in safe, legal and ethical practices with digital tools and the protection of intellectual rights and property.<br>3d: Model and promote the management of personal data and digital identity and protect student data privacy. | 0 (0%) - 5.52 (11.04%)<br>The candidate's lessons provided little evidence of their ability to inspire students to positively contribute to and responsibly participate in the digital world. | 5.6 (11.2%) - 7.12 (14.24%)<br>The candidate's lessons provided some evidence of their ability to inspire students to positively contribute to and responsibly participate in the digital world. | 7.2 (14.4%) - 8 (16%)<br>The candidate's lessons fully demonstrated their ability to inspire students to positively contribute to and responsibly participate in the digital world. |

*continues on following page*

*Table 2. Continued*

| | 1 = Approaches | 2 = Meets | 3 = Exceeds |
|---|---|---|---|
| **Standard 4: Collaborator**<br>**Educators dedicate time to collaborate with both colleagues and students to improve practice, discover and share resources and ideas, and solve problems.**<br>4a: Dedicate planning time to collaborate with colleagues to create authentic learning experiences that leverage technology.<br>4b: Collaborate and co-learn with students to discover and use new digital resources and diagnose and troubleshoot technology issues.<br>4c: Use collaborative tools to expand students' authentic, real-world learning experiences by engaging virtually with experts, teams and students, locally and globally.<br>4d: Demonstrate cultural competency when communicating with students, parents and colleagues and interact with them as co-collaborators in student learning. | 0 (0%) - 5.52 (11.04%)<br>The candidate dedicates little or no time to collaborate with both colleagues and students to improve practice, discover and share resources and ideas, and solve problems. | 5.6 (11.2%) - 7.12 (14.24%)<br>The candidate dedicates some time to collaborate with both colleagues and students to improve practice, discover and share resources and ideas, and solve problems. | 7.2 (14.4%) - 8 (16%)<br>The candidate dedicates time often to collaborate with both colleagues and students to improve practice, discover and share resources and ideas, and solve problems. |
| **Standard 5: Designer**<br>**Educators design authentic, learner-driven activities and environments that recognize and accommodate learner variability.**<br>5a: Use technology to create, adapt and personalize learning experiences that foster independent learning and accommodate learner differences and needs.<br>5b: Design authentic learning activities that align with content area standards and use digital tools and resources to maximize active, deep learning.<br>5c: Explore and apply instructional design principles to create innovative digital learning environments that engage and support learning. | 0 (0%) - 4.48 (8.97%)<br>The candidate designs activities that are somewhat learner-driven and environments that does little to accommodate learner variability. | 4.55 (9.1%) - 5.78 (11.57%)<br>The candidate designs adequate, learner-driven activities and environments that recognize and accommodate some learner variability. | 5.85 (11.7%) - 6.5 (13%)<br>The candidate designs authentic, learner-driven activities and environments that recognize and accommodate learner variability. |
| **Standard 6: Facilitator**<br>**Educators facilitate learning with technology to support student achievement of the ISTE Standards for Students.**<br>6a: Foster a culture where students take ownership of their learning goals and outcomes in both independent and group settings.<br>6b: Manage the use of technology and student learning strategies in digital platforms, virtual environments, hands-on makerspaces or in the field.<br>6c: Create learning opportunities that challenge students to use a design process and computational thinking to innovate and solve problems.<br>6d: Model and nurture creativity and creative expression to communicate ideas, knowledge or connections. | 0 (0%) - 5.52 (11.04%)<br>The candidate integrates little technology that supports student achievement and has little understanding of the ISTE Standards for Students. | 5.6 (11.2%) - 7.12 (14.24%)<br>The candidate integrates some technology to support student achievement of some of the ISTE Standards for Students. | 7.2 (14.4%) - 8 (16%)<br>The candidate facilitates learning with technology to support student achievement of the ISTE Standards for Students. |
| **Standard 7: Analyst**<br>**Educators understand and use data to drive their instruction and support students in achieving their learning goals.**<br>7a: Provide alternative ways for students to demonstrate competency and reflect on their learning using technology.<br>7b: Use technology to design and implement a variety of formative and summative assessments that accommodate learner needs, provide timely feedback to students and inform instruction.<br>7c: Use assessment data to guide progress and communicate with students, parents and education stakeholders to build student self-direction. | 0 (0%) - 4.48 (8.97%)<br>The candidate demonstrates little understanding and use of data to drive their instruction in ways that support students in achieving their learning goals. | 4.55 (9.1%) - 5.78 (11.57%)<br>The candidate understands and uses data to drive their some of their instruction and support students in achieving some of their learning goals. | 5.85 (11.7%) - 6.5 (13%)<br>The candidate understands and uses data to drive their instruction and support students in achieving their learning goals. |

## APPENDIX II: SAMPLE OF SELF-ASSESSMENT TOOLS

### Pre-Reflections on Lesson Preparation

#### Section 1: Reflecting on Assessing Prior Knowledge and Planning Instruction

Please answer these questions:

- What do the students need to know prior to the lesson?
- How will prior knowledge and experience be assessed?
- How will you use this information in the planning process?
- Why should the content of this lesson be taught at this grade level?
- How do the objectives that you have for the lessons align with the standards?
- When will the lesson be taught in the course of the school year? Why?

#### Section 2: Reflecting on Designing Instruction (InTask Standards 7 and 8)

Please answer these questions:

- Why are you using the instructional methods you have described?
- How do the instructional methods align with what you know about best practices (think about your methods classes)?
- How is your lesson designed to meet the needs of all students?

#### Section 3: Reflecting on Planning Assessment (InTask Standard 6):

Please answer these questions:

- How does the assessment align with the standards and objectives of this lesson?
- How does the assessment demonstrate that the students have been successful in learning the content?
- How does the assessment demonstrate student engagement in higher order thinking?
- How does the assessment demonstrate that individual student needs were met?

#### Section 4: Reflecting on How your lesson meet each of the ISTE NETs Standards?

Reflection: How does your lesson meet each of the ISTE NETs Standards?

1. How does your lesson meet Standard 1: Facilitate and Inspire Student Learning and Creativity?
2. How does your lesson meet Standard 2: Provide Digital-Age Learning Experiences and Assessments?
3. How does your lesson meet Standard 3: Model Digital-Age Work & Learning?

4. How does your lesson Meet all four elements of Standard 4: Promote and Model Digital Citizenship and Responsibility by:
    - advocating, modeling, and teaching safe, legal, and ethical use of digital information and technology, including respect for copyright, intellectual property, and the appropriate documentation of sources.
    - addressing the diverse needs of all learners by using learner-centered strategies providing equitable access to appropriate digital tools and resources.
    - promoting and modeling digital etiquette and responsible social interactions related to the use of technology and information.
    - developing and modeling *cultural understanding* and *global awareness* by engaging with colleagues and students of other cultures using digital-age communication and collaboration tools.

## Post Reflections on Lesson Implementation

1. Instructional Decisions/Teaching (In-Task Standard # 9): Discuss the implementation process and describe:
    - What went well and what didn't go well during the implementation of your lesson?
    - How well was the alignment to objectives and standards maintained?
    - Describe any modifications made during the implementation of the lesson
2. Mechanics:
    - What technologies did I use (for the teacher and the learner)?
    - How were the technologies used (by whom and in what manner)?
    - My lesson was within the correct time frame
        - It was short because…
        - It was too long because…
        - The lesson was within the correct time frame because...
3. Assessment of Learning (In-Task Standard # 6): Refer to Assessing Student Learning
    - Include at least 2 digital artifacts that demonstrate what you or your students (peers) have created as a result of your lesson
    - Describe your students' level of success in achieving the standards and objectives for your lesson based on your assessment
    - Describe the level of success you had in teaching the lesson
        - How do your individual reflections support this?
        - How do the comments from your classmates support this?
4. What did you learn from designing and teaching this lesson and how will you use this in the creation of future lessons/learning activities?

# Chapter 22
# Using Digital Tools to Foster Student Engagement Within the Universal Design for Learning Framework

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## ABSTRACT

*Students are diverse. They vary widely in their background knowledge, interests, languages, academic strengths, and learning needs. In order to retain these students, higher education institutions must create flexible and engaging learning environments. Universal design for learning (UDL) is a research-based framework used to guide the development of instructional goals, teaching methods, materials, and assessments to meet the needs of all learners. The three overarching UDL principles and corresponding guidelines are discussed as a framework for making decisions about integrating digital tools into teaching and learning environments. Examples of how the authors have used technology to meet the guidelines in higher education classrooms are provided.*

## INTRODUCTION

Today's college students do not resemble the typical college students of the past. They are diverse in age, family, income, background, race, religious affiliation, sexual orientation, interests, strengths, and knowledge. Specifically, about 74% of current undergraduates have at least one non-traditional charac-

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teristic, such as paying for college themselves, having children, working full-time, being older, or attending school part-time (NCES, 2015). Zehner (2018) reports that 17.7% of undergraduates at large public research universities self-identified as having a disability. Furthermore, according to the United States Department of Education (McFarland et al., 2018), only 60% of students who started seeking bachelor's degrees in 2010 graduated with a degree by 2016. While multiple factors interact to impede students from graduating, the authors posit that providing students with opportunities for flexible learning through the use of digital tools can help meets the needs of this diverse student body. Creating personalized, hands-on learning environments that enable students to apply knowledge and skills requisite for the discipline can enhance engagement and thus retention and completion.

While the growing availability of digital tools, in combination with the diverse needs of students, has made fostering student engagement more complex, the Universal Design for Learning (UDL) framework can serve as a guide to help educators navigate this increasingly complex process. By using the UDL framework to purposefully integrate digital tools in the classroom, educators from any discipline can foster collaboration and engagement as well as help their students develop a deeper understanding of course content. A UDL designed curriculum affords students with the opportunity to access resources, participate in their own learning, and express what they know via mitigating barriers to learning.

This chapter addresses how the UDL principles and guidelines provide a framework for utilizing digital tools to offer students multiple means of engagement, multiple means of representation, and multiple means of action and expression. Examples of technology activities used in higher education classrooms at both the graduate and undergraduate levels in teacher and counselor education are provided.

## THE UNIVERSAL DESIGN FOR LEARNING FRAMEWORK

Universal Design for Learning (UDL) is a framework "to improve and optimize teaching and learning for all people based on scientific insights into how humans learn" (CAST, 2019, para. 2). UDL offers a guide for educators to follow in the development of instructional goals, teaching methods, materials, and assessments that meet the needs of all learners. Goals are defined as learning expectations that reflect the skills students need to master. Methods are the instructional strategies and techniques used to support student learning. Materials are the actual resources used to present content in an understandable and interactive way, and assessments are used to gather information about students' knowledge and skills. The focus of the UDL framework is creating a curriculum that is responsive, student-centered, and relevant, and which allows students to demonstrate knowledge and skills in a flexible manner.

Using UDL to develop curriculum stems from the idea of universal design in architecture. The concept, created by architect Ron Mace, is defined as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" (Center for Universal Design, 2008, para. 2). When using universal design to design buildings, architects consider all possible users before the construction of a building and make design decisions accordingly. Rather than having to retrofit a building after it has been constructed, accessibility features such as wide doorways, elevators, curb cuts and access ramps are present from the beginning. Just as curb cuts and elevators are beneficial to people with or without disabilities, a well-designed curriculum, accessible to all types of learners, enhances the learning environment for all students. Building flexible features into curriculum beforehand increases accessibility for all students.

In 1984, neuropsychologist David Rose and educational designer Anne Meyer founded the nonprofit Center for Applied Special Technology (CAST), with the mission "to improve education, for all learners, through innovative uses of modern multimedia technology and contemporary research in the cognitive neurosciences" (CAST, 2019, para. 2). The team initially investigated alternatives to printed text, made possible by the advances in personal computing, including the development of the graphical user interface. CAST focused on using technology to assist students with learning disabilities. After a decade of work, CAST began to see that accommodations made for students with learning disabilities were also beneficial to students without them. For example, technological advances such as audio books, touch screens, and voice-activated computing, such as Alexa, moved beyond assistive technology intended for individuals with specific needs and is now used by all types of learners. With this change in perspective, CAST pivoted their focus from barriers to education for individual learners to systemic barriers inherent in classrooms, schools, and educational systems. The founders viewed traditional curricula as "too narrowly conceived, designed, and implemented" to meet the needs of all students (Glass, Meyer, & Rose, 2013, p. 98).

This shift in thinking resulted in the UDL framework, guided by the premise that there is no such thing as a "typical" learner. In fact, planning instruction for "typical" students inevitably leaves many students disengaged in learning, without proper access to materials, and unable to show what they really know. Using the UDL framework, educators acknowledge the variability of learners from the onset and strive to create flexible learning environments that accommodate diverse learner needs and increase participatory active learning for all students (Meyer, Rose, Gordon, 2014). A UDL curriculum provides students with a variety of options for engaging in learning activities, accessing content, and showing what they know.

UDL is organized around three guiding principles: providing multiple means of engagement, multiple means of representation, and multiple means of action and expression (Hall, Meyer, & Rose, 2012). Each principle is aligned with a neurological network associated with the learning brain. The principle of engagement aligns with the affective network, the *why* of learning. This network is engaged when students understand why they are learning what they are learning. When students understand why they are learning something, they are more likely to attend to it. In order to engage in learning, students need to know how course content relates to them and to the real world. After initial student attention is gained, the use of interactive teaching strategies can maintain student interest. The principle of representation is associated with the recognition network, the *what* of learning. This network relates to how learners take in and apply patterns to new information. In order for students to access what they are learning, course content should be provided to them in multiple formats. This involves presenting information and directions in formats other than printed text. The principle of action and expression aligns with the strategic network, the *how* of learning. This network helps students plan and perform tasks. In order to learn, students should be actively engaged in learning activities. Students are afforded with varied opportunities to engage with the content, scaffolded content and assignments, and diverse assessment opportunities beyond tests and papers. Each principle is further illustrated by a set of guidelines and checkpoints that provide concrete recommendations for the design, selection, and application of learning tools, methods, and environments. *Table 1* displays the UDL principles and associated guidelines.

Empirical research provides evidence that UDL is effective in higher education across undergraduate and graduate programs, within multiple disciplines, and in both online and traditional courses. While the research base for UDL is more extensive in the K-12 setting, there is a growing body of work in higher education (Al-Azawei, Serenelli, & Lundqvist, 2016; Davies, Schelly, & Spooner, 2013; Roberts, Satlykgylyjova, & Park, 2015; Gravel, Edwards, Buttimer, & Rose, 2015). In a review of the UDL literature,

*Table 1: UDL Principles and Guidelines*

| Multiple Means of Engagement | Multiple Means of Representation | Multiple Means of Action and Expression |
|---|---|---|
| • Provide options for perception.<br>• Provide options for language, mathematical expressions, and symbols.<br>• Provide options for comprehension. | • Provide options for physical action.<br>• Provide options for expression and communication.<br>• Provide options for executive functions. | • Provide options for recruiting interest.<br>• Provide options for sustaining effort and persistence.<br>• Provide options for self-regulation. |

Source: (Meyer et al., 2014)

Al-Asawei et al. (2016) found positive results regarding UDL implementation in eleven of the twelve included studies. Eight of the studies reviewed took place in higher education.

In studies measuring student satisfaction, both graduate and undergraduate students reported increased satisfaction when faculty embedded UDL elements in coursework. For example, He (2014) found that in an online course designed and delivered using the UDL framework, graduate and undergraduate teacher candidates cited specific UDL features of the course, including timely feedback and access to a variety of course materials in a variety of formats, as contributing to their increased self-efficacy in teaching and learning. Similarly, Kumar and Wideman (2014) developed a face-to-face undergraduate health sciences course using the UDL framework and found that students praised the increased flexibility (e.g. working alone or in groups, format of final assignment), had increased interactions with peers and instructors, and appreciated access to course materials in multiple formats. Students who worked full-time in addition to going to school full-time or who had long commutes, traits indicative of non-traditional college students, reported an overall reduction in stress because of the flexibility, course design, and organization. Tharp, Howarton, Wirtanen, Rodrizuez, and Ding (2012) also found that students responded favorably to choice in assignment topics and formats, and appreciated access to course materials in multiple formats.

Students also report positive self-perceptions of increased learning when educators embed UDL features in coursework. For example, students enrolled in an introductory biology class self-reported that the online materials designed using the UDL framework improved their organization and understanding of biology content (Bongey, Cizadlo, & Kalnbach, 2010). Similarly, teacher education students strongly agreed that having UDL principles infused in an online course positively impacted their learning (Scott, Temple, & Marshall, 2015). While grades on assignments were not used as outcome measures in either of these studies and further research is needed, these findings provide positive momentum for using UDL to design curriculum in college classrooms.

Furthermore, faculty share positive feedback after implementing UDL features in coursework. For example, STEM faculty (specifically engineering and technology, natural sciences, biology, mathematics, chemistry, humanities, and physical science) reported increased student engagement, positive student feedback, and increased student self-sufficiency in courses redesigned using the UDL framework (Langley-Turnbaugh, Blair, & Whitney, 2013). Smith (2012) measured student use of UDL features embedded in a face-to-face graduate class and student engagement. Findings indicate a positive relationship between UDL strategies and increased student engagement. Faculty also reported that using the UDL framework to guide course development resulted in a closer alignment of course goals and instructional practices (Smith, 2012).

While additional research needs to be conducted on UDL in a higher education setting (Boothe, Lohmann, Donnell, & Hall, 2018; Gradel, & Edson, 2009; Gravel et al., 2015), specifically with regard to increased student learning as an outcome variable, sufficient research exists to suggest that UDL is a useful framework to guide curriculum development that better meets the needs of diverse student bodies. In the remainder of the chapter, each UDL principle is further described and examples of technology uses corresponding to the principle are provided.

## FOSTERING FLEXIBLE LEARNING ENVIRONMENTS: MULTIPLE MEANS OF ENGAGEMENT

Engaging in the learning process is the first step in creating a successful learning experience; however, faculty must note that the learning process varies widely from student to student (Hall et al., 2012). Factors such as background knowledge, culture, interest, and content relevancy impact student affect and engagement (CAST, 2019). UDL guidelines for increasing student engagement include: (1) recruiting student interest, (2) sustaining student effort and persistence, and (3) self-regulation (Hall et al., 2012). Educators can foster multiple means of engagement by making content relevant to students, allowing students to choose topics or formats for projects, providing concrete and actionable feedback, fostering collaboration among students, and encouraging self-assessment.

Digital tools help foster engagement by increasing communication and collaboration between students and their classmates, teachers, and the larger community. McKnight et al. (2016) studied technology use in seven exemplary schools across the United States and found that providing avenues for communication among students not only increased communication, but also transformed learning and knowledge creation from an individual to a collaborative activity. Additionally, Jesson, McNaughton, Wilson, Zhu, & Cockle (2018) found that rates of peer collaboration increased over time in technology-rich classroom environments. Technology tools facilitate these processes through the use of shared documents, discussion boards, interactive audience response, digital quizzes, and social media sites.

### Collaborative Projects Using Shared Documents

There are a variety of digital tools that allow students to work concurrently in the same digital space. This allows for *increased opportunities for sustaining effort and persistence by fostering collaboration and community* (CAST, 2019) within and beyond a physical space. For example, an instructor in a counseling course requires her students to work in small groups, or "treatment teams," to complete a case study about a hypothetical client struggling with depression. The case study materials, videos, a Mental Status Exam worksheet, and a lesson plan template are housed in a shared Google folder. Students complete the Mental Status Exam, a comprehensive treatment plan, and a lesson plan in preparation for a small group session that the client will attend. The lesson plan addresses one of the presenting issues with which the client is struggling. Each student in the treatment team is assigned various tasks to complete during the case study. Once all students complete their assigned parts, they then discuss their responses, impart feedback, and make modifications prior to uploading their final version into the shared Google Drive folder. By posting their final products to a shared drive, students develop a sense of shared purpose and community. Furthermore, the class collaboratively creates a toolbox of resources students can use in their own practice after graduation, optimizing relevance, value, and authenticity (CAST, 2019) of the assignment.

### Immediate Feedback From Formative Assessments

Research suggests that immediate feedback to students about their learning status improves learning (McKnight et al., 2016). Furthermore, providing students with immediate feedback on an assessment *increases options for effort and persistence through mastery-oriented feedback* (CAST, 2019). Therefore, students can better understand what they know well and what they need to work on, make corrections, and revise misconceptions. Quizzes developed in an online learning platform such as Blackboard, Moodle, or even a Google Form can be set up for automatic grading. Thus, students receive immediate feedback regarding their level of understanding on current course content. Quiz feedback can include not only whether the answer was right or wrong, but also additional instruction from the faculty member. For example, if a student gets a question wrong, feedback can include an explanation of why the answer choice was not correct and even what class materials the student should review to clear up the misconception. In addition, students are more likely to retain information when they are asked to recall it repeatedly over time (Agarwal, 2016). Developing multiple, increasingly cumulative quizzes throughout a course is one way to foster this recall.

### Live Interactive Audience Response Tools

Technology promotes increased engagement for all students, rather than a select few that choose to participate, and *provides increased options for sustaining effort and persistence* (CAST, 2019). Using tools such as Pear Deck, Poll Everywhere, or sli.do (see *Table 2* for further information on these digital tools) makes class more stimulating, interactive, and experiential. Research suggests that students like when their responses are anonymous, as they do not feel targeted for unpopular responses or experience feelings of shame for incorrect answers (Sun, 2014). Thus, allowing anonymity may increase student participation. Each of the aforementioned tools can be embedded in presentation software. Students have the opportunity to respond to a prompt or answer a multiple choice or open-ended question in a creative manner, allowing them to process, reflect upon, and apply information learned in a student-centered and culturally-responsive manner. The responses are then collectively projected onto the screen and processed in a large group setting in order to promote discussion and foster learning. Therefore, rather than purely lecturing and administering a traditional assessment, using technology to stimulate learning makes the educational process more enjoyable, relevant, timely, efficient, data-driven, rigorous, and inclusive, while also helping to augment retention of information learned.

## INCREASING STUDENT ACCESS TO FLEXIBLE CONTENT: MULTIPLE MEANS OF REPRESENTATION

Many courses in higher education require a significant amount of reading and present information in a predominantly lecture format. However, giving students access to course content in a variety of formats can increase student engagement. In a study examining technology use in daily classroom practices, Yarbro, McKnight, Elliott, Kurz, and Wardlow (2016) found that direct instruction of content was the most commonly used digital instructional strategy in mathematics and English language arts classrooms. Direct instruction strategies include lecturing, providing resources to fill gaps in knowledge, and explaining relationships and procedures. Providing multiple representations of complex content

*Table 2: Live Interactive Audience Response Tools*

| Digital Tool | URL | Description |
|---|---|---|
| Pear Deck | www.peardeck.com | Pear Deck allows audience interaction during slide presentations with draggable, multiple choice, drawing, and free response options. Instructors can project anonymous responses on the interactive whiteboard. Pear Deck is intended for use with Google Classrooms. |
| Poll Everywhere | www.polleverywhere.com | Poll Everywhere allows for the instructor to ask questions which attendees can respond to via SMS texting or the web. Instructors can display responses in real time. Poll Everywhere is intended for use with Powerpoint, Google Slides, and KeyNote. |
| Sli.do | www.sli.do | Sli.do allows the instructor to crowdsource questions. Participants can suggest questions anonymously and other participants vote, by selecting the thumbs-up or thumbs-down option, on which questions they would most like to discuss in class. Sli.do can be used on a smartphone, tablet, or computer. |

while employing these methods gives students more pathways with which to make connections to the information. Watching a brief video about a real-world application of thermodynamics or viewing an infographic outlining photosynthesis can go a long way in clarifying concepts. Within the UDL framework, guidelines for multiple means of representation include: (1) perception, (2) language and symbols, and (3) comprehension (Hall et al., 2012). Providing course content in both visual and auditory formats, clarifying vocabulary, distributing reading guides, and explaining patterns or relationships between ideas are ways to offer multiple means of representation for learners.

Improving access to course content through the use of digital tools can lead to learner-centered strategies correlated with increased learning (McKnight et al., 2016). Digital content can foster an individualized, self-directed learning experience for students by allowing them choice and control of the learning process. Therefore, providing students with access to audio and video content, microblogging, and graphic organizers can increase flexibility of learning via a learner-centered approach and multiple means of representation.

## Audio and Video Content

The web is replete with speeches, TED talks, YouTube videos, and podcasts that faculty can use to supplement a textbook. Not only are students accustomed to consuming information in this way, these resources also help connect course content to the real world. Using audio and video content *increases options for comprehension by supplying background knowledge* (CAST, 2019). New material is introduced, and all students have the same reference point and background information.

In an educational research course, students watch videos and listen to TED talks to supplement course readings. In the beginning of the course, students read the first chapters of the text, introducing them to the importance of making evidence-based decisions using the scientific method. Students also listen to renowned scientist Naomi Oreskes, professor of the history of science and affiliated professor of earth and planetary sciences at Harvard University, explain the scientific method and why science should be trusted in a 13-minute excerpt from TED Radio Hour. Hearing a practicing scientist explain scientific reasoning with current examples increases relevance for students. Furthermore, access to this audio clip gives them another way to process the information in addition to reading the content in the textbook.

In the same course, students study experimental design. Before introducing concepts specific to experimental design, such as internal and external validity, students watch an eight-minute segment from the Food Network TV show *Food Detectives* called Turkey Test. The food detective, host Ted Allen, is investigating if tryptophan, a chemical found in turkey, really makes you sleepy. The experiment involves cast members eating a variety of foods typically found at Thanksgiving dinner. Then, the cast goes to a sleep research center to have their sleep monitored by a doctor via electrodes attached to each cast member's head. By watching the video, students are exposed to a variety of vocabulary words related to experimental design. In addition, students immediately want to start talking about what is wrong with the study. This provides an engaging, natural introduction to internal and external validity, a topic with which many students struggle. While students can easily discuss how the study could have been improved, at this point in the course students do not have a command of the terminology. The video allows the students and the instructor to refer to the video's concrete, fun example. This makes the transition into more formal settings less intimidating and more accessible.

## Microblogging

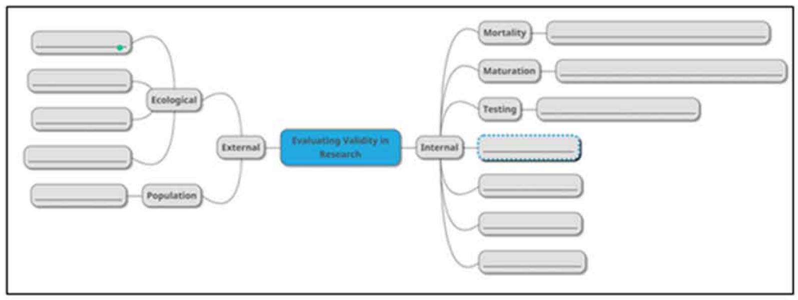
Microblogging, typically through the Twitter platform, can extend learning beyond the face-to-face time in class. Twitter offers instructors a way to easily share interesting articles, videos, infographics, or any number of multimodal resources with students at any time. This provides *increased options for comprehension through maximizing transfer and generalization of course content* (CAST, 2019). Instructors can create a hashtag and share that hashtag with students. In this way, students can not only follow the conversation and interact with the instructor-posted resources, but they can also post interesting content-based resources themselves. A quick search of Twitter indicates that hashtags such as #BIO350 (microbiology), #MATH350 (statistics), and #ECED352 (early childhood education) are currently being used by instructors and students.

In a technology for the inclusive classroom course, a course that educates teacher candidates on how to integrate technology in a purposeful, pedagogically sound way, the instructor uses the hashtag #EDCO305 for undergraduate students and #EDCO602 for graduate-level students. Via these hashtags, students can post responses to queries and can share innovative, instructional uses of technology with one another. For example, one teacher candidate posted about how students in her second grade classroom could use Flipgrid, a digital video-recording app, to explain the differences between solids, liquids, and gases. Additionally, students can join personalized learning networks and participate in Twitterchats long after the course has ended, thus extending student learning beyond the semester's finite bounds.

## Graphic Organizers

Equipping students with advanced organizers before they read a text or take notes on a lecture provides *increased options for comprehension by highlighting critical features, big ideas, and relationships* (CAST, 2019). Students see what information is the most important and how concepts are related to one another. Research suggests that graphic organizers assist students in accessing prior knowledge, organizing ideas, and strengthening connections among ideas (Langford, Rizzo, & Roth, 2003). Furthermore, giving students a partially completed graphic organizer prior to beginning instruction allows students to explore concepts on their own, using digital resources provided by the instructor to make additional connections between concepts.

*Figure 1. Graphic Organizer Example*




In an educational research course, students are supplied with an advanced organizer on internal and external validity before the lecture. Some parts of the organizer are left blank for students to fill in during class. There are many free graphic organizer websites and templates online, such as www.mural.co, www.mindmup.com, and www.visme.co. Graphic organizers can also be created in a word processing program or using the Google Suite of Tools. The graphic organizer in *Figure 1* displays information related to internal and external validity. Some information is provided, but students are expected to fill in the rest throughout the lecture.

## PROVIDING FLEXIBLE ASSESSMENT OPTIONS: MULTIPLE MEANS OF ACTION AND EXPRESSION

Students differ in the ways in which they are able to communicate their understanding of course content (Chandler, Zaloudek, & Carlson, 2017). Using the UDL framework, educators can provide students with flexible options to demonstrate mastery of course content through: (1) physical action, (2) expression and communication, and (3) executive functions (Hall et al., 2012). Giving students access to digital tools and assistive technologies, having students use multiple media for communication and composition, and helping students to set goals and monitor their progress are all ways in which educators can provide multiple means of action and expression. Students are more likely to be engaged if the assessments and projects are authentic and digital tools allow students to produce knowledge themselves. While tools may change, good assessment practices stay the same (Fisher & Frey, 2015). In order for instructors to understand what students know and to be able to share targeted, formative feedback, assessments must encompass more than the traditional midterm and final evaluations. Providing students with the opportunity to create an infographic, compose a digital story, or participate in a digital scavenger hunt allows for more student choice in the expression of content knowledge, and therefore more flexible assessment options.

### Infographics

According to Kelsie Fowler (2015), an infographic is “a visual representation, chart, or poster of information about a particular topic” (p. 44). The word was composed by combining *information* and *graphic*. An infographic consists of visual elements such as images, graphs, or flowcharts to display information and processes. Common formats for infographics include compare and contrast, procedural steps, timelines, lists, and data summaries. Regardless of format, within and beyond the classroom, infographics should demonstrate an understanding of content (Abilock & Williams, 2014). Having students generate infographics provides *multiple options for expression and communication by using multiple tools for knowledge construction* (CAST, 2019).

In a graduate-level, literacy foundations course, students are required to conduct research on a literacy topic such as diverse texts, digital literacies, authenticity in the literacy classroom, critical literacy, or community literacies. After researching traditional and multimodal texts, the students must create an infographic to represent their new learning. To connect their learning with the world beyond the classroom, these current and future teachers must share the infographic with other stakeholders in education such as administrators, fellow teachers, school board members, or faculty members at the university. Students solicit feedback from these stakeholders and then utilize the feedback to help inform their future work in literacy. An example of an infographic is displayed in *Figure 2*.

Infographics can be used in conjunction with more traditional assessments as well. For example, students can write a research paper, but also develop an infographic to present the information to classmates. In addition to learning content, student media literacy, research, and communication skills improve when students create digital artifacts. For example, Jesson et al. (2018) found that when students use technology routinely to create digital artifacts, writing skills increase.

## Digital Storytelling

Digital storytelling is a multimodal composition containing any combination of images, narration, music, and video; this construct typically takes one of three forms: personal or narrative stories, stories that inform or instruct, or stories that retell historical events (Robin, 2008). Snelson (2018) reports that teachers in multiple disciplines find student video production an effective teaching strategy. When students create digital media themselves, they move from passive consumers of digital media to active producers and are more likely to be engaged in learning (Kim & Searle, 2017; Snelson, 2018; Jesson et al., 2018). This is another example of *increasing options for expression and communication by using multiple media for communication* (CAST, 2019).

In an undergraduate technology integration course designed for teachers, students are asked to create a digital story on a topic of their choosing. Since the purpose of this course is to provide students with the opportunity to gain experience integrating digital tools into classroom practices, students are given leeway to choose both the form of digital story as well as the topic. After students decide the form and topic, they select photographs and short video clips, write scripts, and think about how music can help set the tone of the video. After the preparation work, students narrate over the photos and videos, add the chosen music, and share their videos on sites like YouTube or Vimeo. Although topics vary widely, most involve emotion; recent topics include a student's battle with depression, growing up as LGBTQ in the rural south, and learning how to lead on a college campus. Furthermore, students can use this platform to advocate for important topics; in the last academic year, one student chose to discuss the Black Lives Matter movement. Not only was the instructor able to gauge the student's understanding of the topic and assess his work, but his digital story was also able to be shared far and wide. Therefore, his ability to advocate for a topic about which he felt strongly was augmented through the use of digital tools. While this digital storytelling project was done in a technology course, it could easily be adapted for any content area. Instructors could provide the topic (mitosis and meiosis, quadratic equations, Macbeth)

*Figure 2. Infographic Example*

and parameters to ensure students are furthering their content knowledge. The very nature of a digital storytelling project allows for alternative perspectives to be explored (Mantei & Kervin, 2017), further deepening a student's understanding of the content.

### Digital Scavenger Hunts

When assessments, or assignments, involve students actively engaging in discovering and creating, learning is meaningful (Burley & Price, 2003). Sending students on digital scavenger hunts is one way to *increase engagement through increasing options for physical action by varying methods for response* (CAST, 2019). In a digital scavenger hunt, the topic or concept is assigned. Then, students must take or find photographs to illustrate the named concept. Instructors can also require a spoken or written narrative component. This gives space for students to elaborate on how the selected image illustrates the concept.

In a graduate technology integration course designed for education majors, students complete a digital scavenger hunt in which they take photos to illustrate abstract course concepts such as the *noise* in Schramm's Communication Model, Dale's Cone of Experience Model, or one of Gagne's nine events. Students work in groups to take photos around campus that illustrate their assigned course concept. Although the students in this particular course are required to take their own photographs, this activity could be altered to allow students to find photographs or illustrations online. Images can be distributed through a Google shared drive, Google form, or one of the many digital scavenger hunt websites. These websites give the instructor authority to approve photos before they are available to the class, send messages to the group, and track submissions. Digital scavenger hunts are a creative way for students to engage with content and demonstrate their newfound knowledge.

## CONCLUSIONS

Technology affords many opportunities for students to engage in our classrooms. There is an abundance of websites, software, and apps from which to choose. Clearly, the simple presence of technology alone will not automatically result in curated digital resources, student communication, or the production of learning artifacts. Even if teachers use the same tool in an instructional sequence, the level of engagement and complexity of the task can be quite different from one implementation to the next (Henderson-Rosser & Sauers, 2017). Faculty must develop learning environments and assignments that facilitate the use of digital tools in a purposeful manner using effective pedagogy (Yarbro et al., 2016) to provide flexible learning options for all (Rogers-Shaw, Carr-Chellman, & Choi, 2018). Multiple faculty have reported using the UDL framework to simply evaluate coursework (Morra & Reynolds, 2010) or to redesign coursework effectively (Scott et al., 2015; Tharp et al., 2012) to better meet the needs of a wide range of learners.

The examples provided above demonstrate how technology can be used to promote a classroom climate that is collaborative, engaging, interactive, and student centered. When students feel material is practical, applicable, and significant for their future, they demonstrate greater engagement and experience greater satisfaction in the class in regard to achieving course objectives. Technology will never replace teachers. Rather than seeing technology as the foe and as being a means of disrupting or interfering with learning, it is encouraged that instructors today use technology to extend, magnify, and reinforce learning in order to meet the diverse needs of students.

Integrating technology tools that encourage critical thinking, comprehension, discussion, and sharing is an essential part of teaching today in order to augment learning. Students thrive in class when they feel accountable, challenged, motivated, and involved, and when the information they are learning is delivered in a way that is reflective of their learning needs, interests, and objectives. Utilizing technology will not only help meet the diverse learning needs of students, but also enhance collaboration and prepare students for their future careers and post-secondary plans, as it assists students in accessing the most up-to-date information in an efficient manner. Technology also helps students take ownership and responsibility for their own learning, as well as improving their decision making skills when answering and responding to questions in a thoughtful manner. Ultimately, integrating technology into teaching allows students to become more creative and empowered, to experience more exposure to skill building, and to be more connected to information and one another.

The underlying purpose of the UDL curriculum is to develop expert learners whom are inspired and highly active, learners engaging in reflection, monitoring their own progress, and regulating and maintaining their interest during the learning process. Through using digital tools in the classroom, students are able to implement and employ information learned in a way that is reflective of their interests and communication styles, further fostering student learning, participation, and retention of information. When using the UDL framework, the focus becomes the curriculum itself and creating a curriculum that is responsive, student centered, relevant, and emphasizes innovation in the demonstration of knowledge and skills.

Utilizing a UDL curriculum is paramount in fostering a culturally responsive learning climate, as instructors need to be mindful that students have a varied background knowledge, a myriad of experiences, and complex non-school commitments. Technology tools allow students to collaborate and engage in curricula that aligns with their learning needs in an innovative, hands-on, and experiential manner. Students can have the opportunity to work individually, in small groups, or in a large group setting. This fosters communication and amplifies the sharing of thoughts, the consideration of other perspectives, and the exchange of ideas, all of which are essential skills for students to possess and to develop. In turn, the applied curriculum promotes retention through action, and the obtained information becomes more application based.

The UDL framework provides a structure that faculty can use to guide instructional planning. By utilizing UDL, digital tools and activities like those outlined above can be aligned with effective teaching practices to meet the needs of all learners. Selecting tools because they are fun or flashy will not guarantee student learning and engagement. Certainly, students can appear highly engaged in our classrooms but not learn anything. The UDL framework merely provides a structure to guide faculty choices regarding digital tools and teaching methods.

Developing curriculum that uses digital tools to provide students access to information in multiple formats, to engage students in collaborative environments, and to promote student creation of learning artifacts will likely lead to positive student learning outcomes. While the UDL framework encompasses multiple facets of teaching and learning, Boothe et al. (2018) recommend starting small with course redesign and adding more UDL features over time. Therefore, we offer these steps as a starting point to guide your curricular revisions:

1. To begin, think about stumbling blocks in your current curriculum. Consider the following questions: With what content do your students struggle? What content do you find the most difficult to teach? What teaching methods, materials, or assessments need to be altered to better meet the needs of students?
2. Match the identified curricular issue with the corresponding UDL principle. Do you need to provide additional resources in varying formats? Are students disengaged during class-time? Would students be better able to demonstrate their learning if you diversified assessments?
3. Visit cast.org to see additional examples of UDL research-based practices in educational settings. Each principle is discussed in-depth and includes multiple, practical examples of implementation. Next, visit udloncampus.cast.org for specific examples and resources related to higher education.
4. Implement the changes. Be purposeful and clear with students. Tell them why you are making the change, and after you introduce new media, methods, or assignments, solicit student feedback.
5. Revise and try again. As instructors, we know we will always revise our teaching methods and materials. We also know that what works for one group of students won't necessarily work for another. Continuing to monitor student success and to adjust our methods accordingly will ensure that we meet the needs of more students in our classrooms.

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## KEY TERMS AND DEFINITIONS

**Digital Scavenger Hunts:** Using a digital camera to document an item on a scavenger hunt has been found.

**Digital Storytelling:** Using digital media tools to combine audio, still images, and text to tell a story.

**Graphic Organizers:** A visual display of information used to show relationships between facts, concepts, ideas, or thoughts.

**Live Interactive Audience Response:** Software used to collect and display audience responses to survey questions during a live presentation.

**Microblogging:** Sharing short messages with an online audience.

# Chapter 23
# Should Pre-Service Language Teachers Develop Digital Stories?
## Engagement With Digital Storytelling

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## ABSTRACT

*This study investigated pre-service language teachers' experiences and capabilities in DST as well as their views on the use of DST in language teaching. A case study design was adopted in the current study. Eighty-three pre-service teachers participated in the study, and they created 25 digital stories. Data of this study came from the evaluation of digital stories and open-ended questionnaire. Pre-service teachers' digital stories were analyzed using rubrics and subjected to descriptive statistics. Data from an open-ended questionnaire on pre-service teachers' perceptions regarding the DST in language teaching were analyzed using content analysis. The results revealed that despite being novice DST-developers, pre-service teachers were capable of creating digital stories. They reported that DST had the potential to enhance students' learning outcomes. In addition, they were eager to adopt DST in their future teaching. However, they complained that DST required too much time and effort, and sophisticated information and communication technology skills.*

## INTRODUCTION

Storytelling is one of the oldest forms of communication and has widely been used by teachers at all levels of education, from preschool to adult education. It has also been reported as an effective instructional method to facilitate learning outcomes in language, science, math, and technical education (Sharda, 2007). With the advances in Information and Communication Technologies (ICT), today a variety of educational tools, such as Web 2.0 or mobile applications are available. Such improvements have also affected the way teachers design, develop, and use stories for teaching purposes and promoted the emergence of concepts such as digital storytelling (DST).

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Digital Storytelling Association (2011, para. 1) provides a comprehensive description of this new concept: "Digital Storytelling is the modern expression of the ancient art of storytelling. Digital stories derive their power by weaving images, music, narrative and voice together, thereby giving deep dimension and vivid color to characters, situations, experiences, and insights". DST is regarded as the combination of traditional storytelling with digital technologies. With today's technology, it is possible to create DST by combining text, images, digital camera video, or audio with non-linear authoring tools, Web 2.0 applications, and computers. Digital storytellers publish their products in the forms of web pages, interactive web sites, digital audio, digital videos, online games, or virtual reality worlds (Xu, Park, & Baek, 2011).

With respect to their content and key features, digital stories (DS) can be classified in various ways. Based on content, Robin (2008) offers three types of DS: personal or narrative stories, stories that inform or instruct (the type focused on in this study), and stories that re-tell historical events. According to Park and Seo (2009), DST encompasses certain characteristics including flexibility, universality, interactivity, and community formation. DSs include point of view (the main point in the story and the author's perspective), a dramatic question (a question that keeps the audience motivated), emotional content (establishing a powerful personal connection between the audience and the story), the gift of the narrators' voice (personalization of the story for the audience), the power of the soundtrack (the music embedded), economy (presenting the content in a concise manner avoiding cognitive or sensory overload), and pacing (the rhythm of the story) (CDS, 2005).

## DST in Teaching and Learning

Previous research has indicated that although DST has been seen as a complex, comprehensive, and difficult process by teachers and students (Sadik, 2008; Sancar-Tokmak & Yanpar-Yelken, 2015), it has had positive influences on students' learning, motivation and engagement, attitudes towards lesson, and thinking skills (Hung, Hwang, & Huang, 2012; Schmoelz, 2018). It is asserted that DST facilitates the convergence of four student-centered learning strategies i.e., student engagement, reflection for deep-learning, project-based learning, and effective integration of technology into instruction (Barrett, 2006). Much of the research on DST has explored the effectiveness of using this tool on student learning outcomes. Sadik's (2008) study showed that DST projects could increase students' comprehension of the course content. In addition, Hung et al. (2011) proposed that a project-based DST approach could enhance students' motivation to learn, problem-solving competencies, and academic achievement. Similarly, Robin (2016) stated that DST provided students with 21st-century skills including digital, global, technology, visual, and information literacies. DST is considered to be aligned with constructivist learning. It provides open-ended, creative, and motivating tools (Sadik, 2008), encourages creative problem solving via peer interaction in a collaborative learning environment (Smeda, Dakich, & Sharda, 2014), and helps learners in creating and discovering knowledge, and in understanding ways to apply new information effectively (Nam, 2017).

As DST is a deep reflective process feeding on the imagination of its creators (Nelson & Hull, 2008), students engage in researching, playwriting, designing, media producing, and educating all at the same time (Chung, 2006). Furthermore, students are considered to improve their narrative styles, writing structures, visual literacy skills, media literacy skills, and understanding of film conventions (Banaszewski, 2005). Students organize and present their findings and conceptions in a clear and lucid manner. Students can also convey their own messages, think deeply, evaluate their ideas, appreciate their thinking, build communication, and criticize their knowledge and ideas (Valkanova & Watts, 2007).

Previous research have reported how second language learning is facilitated by using technology and indicated the crucial role that the multimodal approach has on language learning (Ajayi, 2009; Early & Marshall, 2008). DST is a fine supporter of enhancing learning within multimodal approach. In addition, the pedagogical potential of DST in engaging learners of second language was confirmed (Angay-Crowder, Choi, & Yi, 2013; Johnson & Kendrick, 2017; Kim, 2014). In second language classrooms, DST has been found to facilitate self-expression and communication skills and enhance problem-solving skills, students' motivation, and cooperative learning (Ohler, 2013). Guha et al. (2007) argued that interaction within DST process helps students to collaborating in the target language, negotiate meanings, socially learn, and share experiences in using their language skills. Nilson (2010) suggested that storytelling can be useful for remediation, practice, or review. Additionally, storytelling offers the possibility of meaningful social interaction among students and it enhances interpersonal and story-related skills (Liu, Liu, Wang, Chen, & Su, 2012).

For language education researchers DST has been considered as a powerful tool to facilitate collaborative writing in the language teaching process (Rahimi & Yadollahi, 2017). Additionally, students' interaction with peers and the teacher in writing process encourages them to take active roles in writing exercises. Related literature on the use of DST in language learning process indicated that DST has positive effects on written (Sarıca & Usluel, 2016) and oral skills (Hwang et al., 2016), motivation to learn (Tecnam, 2013), and critical thinking skills (Yang & Wu, 2012). Hsu (2010) reported that the learners, who create DSs, produce longer, more complex oral sentences in language classroom compared to learners received instructions through a textbook. Furthermore, contextualized DST helps learners improve their language comprehension (Huang, 2006). In a one-year study with high school students, Yang and Wu (2012) investigated the effects of DST on academic achievement, critical thinking, and learning motivation in an English course. The experimental study implemented with senior high school students learning English as a foreign language showed that DST participants performed significantly better than lecture participants. All in all, DST has been an effective pedagogical tool in improving the language skills of learners who actively participate in storytelling activities (Lucarevschi, 2016).

## Teachers' Views on DST

Research into pre-service teachers' thoughts about DST for instruction has revealed that they have positive perceptions regarding its use for instruction (Kobayashi, 2012). Pre-service teachers think that DST was instructive, entertaining, and comprehensible (Sancar-Tokmak & Yanpar-Yelken, 2015). In Istenic Starčič, Cotic, Solomonides, and Volk's (2016) study, pre-service teachers stated that DST could be useful in mathematical problem solving for themselves and for their students at various grades. Kocaman-Karoglu (2014) emphasized that pre-service teachers had positive perceptions of DST assuming it as attractive and easy to use, and it enhanced the sharing of emotions and documents. In addition, they found creating digital stories was fun, exciting, motivational, and authentic. In a recent study, Karataş, Kukul and Özcan (2018) indicated that pre-service teachers were satisfied with DST process and believed that DST may positively affect different higher-order thinking skills, particularly creativity. DST has also proved to be a useful training tool for teachers and pre-service teachers. Their technological, pedagogical, and content knowledge (TPACK) and skills could be improved with DST (Sancar-Tokmak & Yanpar-Yelken, 2015).

Contrary to the advantages of DST in education settings, research has also shown that DST may pose challenges. One such challenge is skillfully revealing the massive potential of stories (Ohler, 2013). Integrating DST into the curriculum and courses requires specific skills and experience, such as designing activities that allow DST use (Tsou, Wang, & Tzeng, 2006). Moreover, developing or finding appropriate DSs require teachers' considerable time, and effort, and creativity (Kocaman-Karoglu, 2014; Sadik, 2008; Sancar-Tokmak & Yanpar-Yelken, 2015).

Teacher has a significant role in the integration of technology such as DST into the teaching process. There are several key factors in the integration of technology into teaching in terms of teachers. These are a proper understanding of how to integrate technology into teaching, professional development on technology integration into classroom, the attitudes of teachers, and their perception on the usefulness and ease of use of technology (Cuhadar, 2018). Teachers' professional development in using technology and technology integration into teaching influences their perceptions in the easy use of the technological tool, attitudes toward technology and integration of the tool into teaching (Teo, 2011). If pre-service teachers effectively experience the DST process at the undergraduate level, it is more likely they will improve their skills and comfort levels with DST, and integrate it into their teaching in their future classroom (Islim, Ozudogru, & Sevim-Cirak, 2018). Hence, pre-service teachers should be informed and trained about the creation, use, and the evaluation of DSs.

Researchers have focused on the effects of DST on students' learning outcomes and studied pre- and in-service teachers' views and experiences on DST in various fields such as English language, social sciences education, or mathematics education (Islim et al., 2018). In order to investigate the effectiveness and applicability of DST in classroom settings, there is still a need for further studies in which DST used in different teaching approaches and learning contexts. Pre-service teachers' successful integration of DST into teaching depends on their ability to create meaningful digital stories and their beliefs about the role of DST in teaching environments (Chen, 2010; Teo, 2009). Pre-service teachers will have the necessary skills in and attitudes toward DST if they are trained and supported with sound instructional strategies (Islim et al., 2018; Sancar-Tokmak & Incikabi, 2013). Very few previous studies have investigated pre-service teachers' capabilities in the DST process and evaluated the quality of digital stories designed and developed by pre-service teachers. While Islim et al. (2018) investigated pre-service math teachers' capabilities in the DST, Sancar-Tokmak and Incikabi (2013) examined pre-service early childhood education teachers' digital stories to evaluate their expertise in DST process. Therefore, in the integration of DST into teaching of different fields, pre-service language teachers' competencies in creating and using DSs are needed to be further investigated. The role of DST as a teaching and learning tool in language learning for pre-service language teachers still needs to be explored further in order to offer better insights into the process and draw implications for teacher educators.

Pre-service teachers are novice in DST process and should practice in creating attractive, encouraging, motivating and instructive DSs to enhance students' learning outcomes, interest and motivation. In this study, pre-service language teachers created their own digital stories to teach language to middle school students. Hence, the current study aims to enhance pre-service language teachers' competencies in creating, using and evaluating DSs and to promote positive perceptions on the use of DST in language teaching. The main aim of this study is to examine pre-service language teachers' potential to integrate DST into their future teaching. Hence, this study investigates pre-service language teachers' abilities to create DS through examining the quality of the DSs designed and developed by pre-service language teachers. In addition, as a critical issue in technology integration pre-service teachers' views on specific technologies should be investigated. Hence, this study reveals pre-service language teachers' concerns and views regarding DST use for instruction. Therefore, the following research questions are addressed:

1. What is the technical quality of the digital stories developed by pre-service language teachers?
2. What are pre-service teachers' concerns and views regarding the implementation and integration of DST in teaching?

## Research Design

This study employed a mixed methods study to investigate pre-service language teachers' capabilities and their views and concerns in DST process. The quantitative part of the study investigated the quality of the DS created by the pre-service teachers. Whereas, the qualitative part of the study examined pre-service language teachers' views on using DST in language teaching classrooms. The mix of qualitative and quantitative part of the study would give hints about pre-service teachers' integration of DST in their future classrooms. Using various data collection tools such as document reviewing and interviewing, the researcher conduct in-depth examinations (Creswell, 2012). Case studies give answers to "why" and "how" questions and the results are not generalized.

### Participants and the Study Context

This study was conducted with 83 pre-service teachers (M = 32; F = 51) of Turkish Language Teaching Department at a public university in Turkey. The ages of pre-service teachers were between 19 and 23. All participants took lessons related to literature, language, and four courses on language teaching. The participants were the students' of the Computer Literacy II lesson which was compulsory and aimed at introducing the use of technologies for teaching and learning. The pre-service teachers had basic computer literacy skills in Computer Literacy I lesson, but they had received no training on DS design and development process.

Prior to the beginning of the DST activity, the pre-service teachers were asked to create groups in three or four, and totally 25 groups were formed. No criteria or skill were required in group creation. The groups were formed with the pre-service teachers' own decisions. The pre-service teachers were provided information about the DST processes including scriptwriting, the design of DST using story mapping, the use of the online DST creation tool, image and sound import, animation making, video publishing, and digital story evaluation criteria.

### Design and Development of Digital Stories

While developing DSs, Kearney's (2011) learning design process was adopted and followed. The four phases in creating digital stories included pre-production, production, post-production, and distribution. In the beginning of the pre-production phase, the pre-service teachers were told that they had to select their teaching content based on the learning outcomes in the secondary school Turkish language course curriculum. The pre-service teachers developed their ideas and narratives, created the storyboards, and selected and created their media such as images, sounds, animations, and videos. They shared their story scripts on their blogs, and members of each group provided feedback to another groups' scripts. In the production phase, the pre-service teachers used their cameras and voice recording features of their smartphones. Free version of Powtoon was utilized to combine the digital images and audio, and to create and add animations between the scenes. Powtoon is a Web 2.0 tool to create videos and presentations. Participants could also pay for the premium version of Powtoon for such purposes. However, the free version provided the basic functionalities needed for DST. Furthermore, Powtoon enabled pre-service teachers to work collaboratively and publish their digital stories as videos on a video sharing platform. In post-production phase, the groups viewed and evaluated each other's story considering the digital story evaluation criteria, and revisions were made based on the suggestions. Finally, DSs were published on YouTube. In total, 25 digital stories were created and published by each group, and each video lasted 3 to 5 minutes. It took the pre-service teachers' 20 hours over five weeks to complete the DST activity.

## Data Collection and Analysis

In the current study, two instruments were used to collect data. One of the purposes of this study was to evaluate pre-service language teachers' performance in designing and developing digital stories. Therefore, Barrett's (2006) Digital Storytelling Rubric was used by the researcher to assess the quality of their digital stories. It included point of view (purpose), point of view (awareness of audience), dramatic question, voice (consistency), voice (conversation style), voice (pacing), soundtrack (originality), soundtrack (emotion), images, economy, and duration of presentation was used. Four levels of descriptors were specified for each attribute i.e., 0 = needs improvement, 1 = satisfactory, 2 = good, and 3 = excellent. While the minimum score of a DS maybe 0, the highest score may be 33. Means and standard deviations were obtained for the data collected using the Digital Storytelling Rubric.

To quantify the capabilities of pre-service teachers' digital story creation, a consensual assessment technique that is widely used to evaluate creative products (Amabile, 1997) was applied to evaluate each group's digital stories. The researcher and two experts in the DST evaluated the quality of the digital stories using Barret's (2006) Digital Storytelling Rubric including the eleven attributes. The inter-rater reliability correlations between the researcher's and the experts' scores were between .77 and .90 ($p < .01$), which shows the evaluation is highly reliable.

To collect data about pre-service teachers' perceptions and views of DST in language teaching at secondary level, an online open-ended questionnaire was administered at the end of the semester. They responded to the following four questions:

1. What are the advantages of using DST in language teaching at the secondary level for teachers?
2. What are the drawbacks of using DST in language teaching at the secondary level for teachers?
3. What can be done to overcome the drawback/s?
4. Would you like to utilize DST in your future profession? Why?

Content analysis (Creswell, 2012) was applied to the pre-service teachers' responses collected with online open-ended questions. The content analysis was conducted by the researcher and two experts. All the data was read to have a general sense of it, and then, related text segments were assigned a code label. The data not related to the research questions were eliminated. Then, according to the codes determined, the themes were created in relation to the related literature focusing on the advantages and disadvantages of new approaches and technologies in education settings. For the computation of the inter-rater reliability, Miles and Huberman's (1994) model of qualitative data analysis was followed. The inter-rater reliability coefficient was calculated as 89.75% and it was assumed that data analysis was reliable. The researcher and the experts compared and discussed the themes and codifications to finalize the themes.

## FINDINGS

### The Quality of Digital Stories

In the current study, the pre-service teachers created a total of 25 digital stories, and the average duration of the digital stories was 4 minutes and 8 seconds. The quantitative analysis of the ratings based on the Digital Storytelling Evaluation Rubric showed that the digital stories developed by the pre-service teachers were at a good level (Table 1). The means of each evaluation criteria varied between 1.44 (satisfactory level) to 2.64 (excellent level). The average mean was 1.97. The analysis revealed that the purpose of the DST was not reflected clearly ($\bar{X}=1.44$) and the conversation style was just at a satisfactory level ($\bar{X}=1.44$). On the other hand, presentation duration (4 minutes and 8 seconds) was at an excellent level, and pre-service teachers were strongly aware of their target audience while designing DSs ($\bar{X}=2.36$). The mean scores for digital stories were between 0.91 (satisfactory level) and 2.64 (excellent level). While six of the digital stories were found to be satisfactory, 12 of them were rated as good, and seven were considered as excellent. The pre-service teachers were found to be satisfactory in evoking the purpose of the digital story and use a conversational style most (70-84%) of the time. On the other hand, they are excellent at adjusting the length of the presentation and strongly aware of the target audience in the design.

### Pre-Service Teachers' Views on DST

The pre-service teachers were asked about the advantages, disadvantages, and potential use of DST in their future profession. The themes were created according to the responses of pre-service teachers and the categories determined by the researcher and peer debriefs. The themes were named as the advantages of DST, the challenges encountered in the DST process, and future projection on the use of DST in teaching language.

*Table 1. Evaluation scores of pre-service teachers' digital stories*

| Category | Mean |
|---|---|
| Point of view - Purpose | 1.44 |
| Point of view - Awareness of Audience | 2.36 |
| Dramatic question | 2.20 |
| Voice - consistency | 2.12 |
| Voice - Conversation style | 1.44 |
| Voice - Pacing | 1.64 |
| Soundtrack - Originality | 2.32 |
| Soundtrack - Emotion | 1.88 |
| Images | 1.72 |
| Economy | 1.88 |
| Duration of presentation | 2.64 |
| **Total** | 1.97 |

*Table 2. Pre-service teachers' views about the advantages of DST*

| | Advantage | Frequency |
|---|---|---|
| 1 | Increasing student involvement and making students active in the lesson | 49 |
| 2 | Getting student attention (interest) | 38 |
| 3 | Making learning fun | 34 |
| 4 | Supporting permanent learning | 18 |
| 5 | Increasing motivation | 17 |
| 6 | Activating multiple senses in learning | 13 |
| 7 | Improving teachers' ICT skills | 13 |
| 8 | Making concepts and ideas more concrete | 12 |
| 9 | Improving teachers' presentation skills | 10 |
| 10 | Helping students learn about new technology/Increasing student interest in technology/Increasing students' ICT skills | 9 |

## The Advantages of DST

Pre-service teachers' opinions were asked regarding the advantages of using DST in language instruction at the secondary level. Their responses were categorized based on emerging themes. The themes and their frequencies are reported in Table 2:

As it can be seen in Table 2, attracting students' attention and interest, making the lesson fun, and increasing student participation were the most frequently stated positive characteristics of DST in the language courses at secondary level. Pre-service teachers believed that students who are interested in the lesson and have fun during the learning process would participate and engage in the learning activities more often. They also believed that using DST would activate multiple senses during learning, improve motivation, and make newly learned concepts and ideas more concrete. Thus, according to pre-service teachers, DST would enhance permanent learning.

The following excerpts from the responses of two participants would further illustrate the ideas presented:

*All students want the lesson to be fun. Different activities used during the learning process both engage them and make learning permanent. DST has the potential to help us in doing this. Watching the DS, the student learns in an audiovisual way, and it helps him/her do the activities. Thus, the student has fun while learning (Student no 64).*

*To me, in language courses, DST has many advantages. For example, it helps to make newly learnt concepts and ideas become concrete by incorporating many senses into the learning process. It makes learning permanent; they do not tend to forget what they see. Their sense of responsibility improves; they are always active because they make comments after the DS. Thus, their critical thinking skills develop. They read and criticize more. Also, their technological competencies improve. Shortly, DST both facilitates teacher's skills on the job and provides students with high quality learning. (Student no 51).*

Furthermore, pre-service teachers mentioned that DST would influence teachers' professional development positively as well. They stressed that using this approach, they can improve their presentation skills, ICT skills, a sense of responsibility as teachers, motivation to teach, and relationship with their students.

## The Challenges Encountered in DST Design

Pre-service teachers' opinions were also sought on the negative aspects of DST and the difficulties encountered while creating and using DST in language courses as well as the solutions they might offer in response to these problems. Most frequently criticism of DST focused by pre-service teachers was that DST activities would take too much of teachers' time. Other difficulties and problems are reported in Table 3:

To pre-service teachers, developing DST sometimes requires complex ICT skills including basic computer literacy skills and special software knowledge. Teachers need to put a lot of effort into it and they need to have access to technological devices and applications. In addition, lack of necessary funding may limit teachers to integrate DST into teaching. The DST process is considered to be quite costly. The final problem identified by the pre-service teachers was that not all learning outcomes and content could be achieved using DST, and DST could not easily be integrated into all subject areas. As a solution to the possible difficulties and the problems identified, they offered professional development activities that provide specific training on technological skills and DST design processes.

## Future projection: Will I use DST?

When the pre-service teachers were asked whether they would use DST in their future teaching situations, 76 (91.56%) of them stated that they were positive about using DST in their classes. Five participants were undecided, and two noted that they would not benefit from DST. The motivation behind pre-service teachers' desire to use DST in their future teaching situations was in line with the advantages of DST they identified (Table 4).

As it can be seen in Table 4, pre-service teachers' reflections reveals that they would use DST in their future teaching situations as they found it fun, useful for attracting students' attention during lessons, and productive for enhancing student engagement and permanent learning. On the other hand, they pointed out that the development and the use of DST for instruction would satisfy several conditions such as having access to technology, improving technological skills, matching learning outcomes, and having enough time.

*Table 3. Pre-service teachers' views on the difficulties and problems in DST*

| | Difficulties and problems | Frequency |
|---|---|---|
| 1 | Demanding too much of teachers' time | 34 |
| 2 | Requiring complex ICT skills | 28 |
| 3 | Having multiple costs (access to technology, effort, money) | 28 |
| 4 | Not being applicable for every content | 13 |
| 5 | Requiring DST development skills | 10 |

*Table 4. Pre-service teachers' views on why they would use DST in the future*

| | *Reasons* | *Frequency* |
|---|---|---|
| 1 | Making learning fun | 30 |
| 2 | Drawing student attention during lessons | 15 |
| 3 | Increasing student participation | 14 |
| 4 | Supporting permanent learning | 10 |
| 5 | Activating multiple senses | 6 |

While talking about the conditions to adopt DST, the pre-service teachers presented their concerns about the downsides of DST, such as the inapplicability of DST for some learning outcomes or goals, and the disadvantage of taking too much of teachers' time and effort. They also stressed that if they had enough technical support, they would integrate DST into their teaching.

## DISCUSSION

Many researchers have emphasized the use of DST for instruction and thus suggested that it could be integrated into pre-service teacher education. Pre-service teachers should know how to use and integrate technology into instruction (Chen, 2010). In addition, pre-service teachers' attitudes toward DST in teaching affect their integration of this approach into classroom settings (Teo, 2009). In this study, pre-service language teachers' skills in digital story development and their perceptions about the use of DST in the teaching of language were examined.

The evaluation of the digital stories created by the pre-service language teachers indicated that although the overall quality of the DSs created by the pre-service teachers was at a good level, individual stories varied between satisfactory and excellent levels. In addition, the mean of each evaluation criterion for DSs ranged from the satisfactory to the excellent level. While the pre-service teachers were excellent at adjusting the length of the presentation and aware of their target audience during the design of the digital stories, they were satisfactory in clarifying the purpose of the story. Furthermore, the digital stories were mainly based on the conversations between the characters in the story. Overall, reviewing the digital stories developed by pre-service teachers, it was observed that they were able to develop digital stories at a good level. Although they were novice developers, they created moderately quality digital stories due to the high quality of the scripts written prior to the digital versions, under the supervision of their instructor and with the help of the peer-feedback provided on their blogs. As indicated by Sancar-Tokmak and Incikabi (2013), pre-service teachers supported with different strategies in the DST process can produce higher quality digital stories. Collaborative writing and peer feedback are considered to enhance the writing process and design (Dippold, 2009). Hence, peer-feedback through blogging may enhance pre-service teachers' DST process.

According to the qualitative results of the study, pre-service teachers believed that DST had the potential to increase learners' engagement during the classroom activities, and increase student participation. They also stated that DST may be an effective tool and approach to draw students' attention and interest to the subject, and learning would be fun with the use of digital stories. This is consistent with the findings of Heo (2009), Kocaman-Karoglu (2014), and Karataş et al. (2018) who found that DST made learning more exciting and fun. Pre-service teachers' potential students prefer to have fun while doing serious work, and new teaching methods are required to keep them engaged in the learning process. DST could be used to make students feel encouraged and motivated to learn as it is seen a fun, interesting and new way of learning for them. Although DST has some difficulties, it was found to be an interesting and fun teaching activity by the pre-service teachers. Hence, teacher educators may encourage and drive pre-service teachers to create and share digital stories in teacher training courses.

The pre-service teachers perceived that their ICT skills were enhanced during the development of DST. In addition, they believed that DST may increase teachers' and students' ICT skills. The findings of the study display similarities with those of other studies to be found in the literature. For example, the results of a study conducted by Kocaman-Karoglu (2014) with 38 pre-service teachers suggested that after creating their DSs pre-service teachers had gained more technology knowledge. This might influence students' transfer of cognitive knowledge to further technology learning. Additionally research by Samcar-Tokmak and Yanpar-Yelken (2015) with 71 pre-service teachers indicated that after DS creation, technological pedagogical content knowledge (TPACK) confidence scores of pre-service teachers significantly improved. Specifically, scores on technological knowledge and technological pedagogical knowledge improved significantly.

The findings also suggest that despite its positive effects on teaching and learning, the there are some difficulties and problems accompanied by the DST process. For pre-service teachers, DST is an approach that requires complex composition and ICT skills, hardware and software, and significant time and effort. This can be attributed to the complex requirements of DST such as composing the narratives by considering the learning content, editing images, sound editing, and animating. Dogan (2010), Kocaman-Karoglu (2014), and Robin (2008) reported similar results in their studies and concluded that barriers in DST integration in learning environments were that it requires technical assistance, too much time to develop, and access to necessary hardware and software.

Along with software for free installed on computers or mobile devices, Web 2.0 technology provides abundant number of tools for educational practitioners to design and develop DSs. Although there are commercial tools, free of charge or demo Web 2.0 applications or tools enable to create DSs. Thereby, free resources might minimize the negative impact of a lack of financial resources on potential implementations. As Kobayashi (2012) and Islim et al. (2018) stated complicated and paid software are not necessary to create effective DSs, and low level technology can help in creating quality teaching environments. The technology integration does not depend on the technological tools used by the teachers and learners, but on what the learners actually learn by using that technology. Additionally, Web 2.0 tools also enable working on a project collaboratively. Hence, teachers might work collaboratively with their colleagues to minimize the negative impact of time. If language teachers do not have the required IT skills to develop DSs, they may work with computer science teachers at their schools. While computer science teachers deal with the technical issues, language teachers may design the story in accordance with the learning objectives.

It might be reflected that pre-service language teachers are positive about using DST in their future classrooms. Similarly, Karatas et al. (2016), and Doering, Beach, and O'Brein (2007) also reported that pre-service teachers are enthusiastic about integrating DST into their future teaching processes. Pre-service teachers' beliefs, attitudes, and thoughts have a strong influence on their choices and future technology integration plans (Chen, 2010). Their positive views on the use of DST in teaching, in other words, demonstrated that they have a tendency to integrate this tool in their classroom activities. This is also reflected in Teo's (2009) study who found that pre-service teachers' beliefs about the advantages and disadvantages regarding the use of DST were closely linked to their behaviors and decisions about DST integration into teaching processes. Integrating technology into teaching should begin with the training of pre-service teachers during their undergraduate studies. If their knowledge of and experience in technology integration is effectively developed during this training period, it is more likely they will use different technological tools and approaches in their future classrooms (Teo, 2009). Although DST is accepted as a useful tool in learning, designing and developing digital stories include complex processes and different skills. Teaching the complex process of DST to pre-service teachers before teaching in their future classrooms will provide them with an insight into how to integrate DST into their teaching.

In this study, prior to the DST process, the pre-service teachers were trained about scriptwriting. Scriptwriting requires students to create and to bring their insights regarding people, events, and concepts. In addition, design and presentation of a script can improve students' narrative style, written composition, visual literacy skills, media literacy skills, and understanding of film conventions (Banaszewski, 2005). A well-designed and shaped path helps students to create their stories. Presentation of a schema and a story map to students helps students to gain an understanding of the structural characteristics of narratives and facilitates the understanding of the components and the relations between the parts of a story. Hence, before writing the narratives of digital stories, teachers may introduce schema and story map to their students in order to enhance students' narratives.

Well-designed narratives could make the DSs more interesting and engaging. The learning design developed by Kearney (2011) and used in the current study will foster sound pedagogical approaches associated with complex and often time-consuming tasks in the DST process. Together with a sound pedagogical framework, teachers and pre-service teachers may develop effective DSs for teaching.

## FUTURE RESEARCH DIRECTIONS

Drawing on previous studies, the rubrics to evaluate the digital stories do not address the instructional quality in detail (Çıralı-Sarıca & Koçak-Usluel, 2016). Instead, DS evaluation rubrics focus on the digital dimension of the DST. In this study, the rubric utilized to evaluate the DSs did not deal with the instructional dimension of the DST either. Not only the technical efficiencies but also the instructional value of DST should be considered in evaluation. In order to reveal the instructional quality of the digital stories, rubrics assessing the instructional dimension of digital stories are required. Hence, future research into DST evaluation may also focus on the instructional quality of the DST in rubric design.

The quality of the DST was evaluated by the researchers and experts in instructional technology and language teaching fields. The effectiveness of DST was not tested in a K-12 learning and teaching environment. Therefore, the quality and effectiveness of DST designed and developed by pre-service teachers may be tested in language classrooms with target group students. Primary and secondary school students may also evaluate the DST developed by potential teachers. Furthermore, it might be interesting to circle back the pre-service teachers to see if they have used the DST skills taught to them once they become teachers.

During the steps of the DST process, the pre-service teachers worked collaboratively. Each of them had different roles and responsibilities. In a different study, collaboration process may be observed and their views about collaboration in the DST process may be revealed. Furthermore, each group of student evaluated another group's narrative and digital story and provided feedback using blogs. Future research may examine the role and effectiveness of peer feedback by using blogs in the DST process. The low number of the participants might be another limitation of this study. Future studies with larger group of pre- or in-service teachers will provide a generalization for the study's findings.

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## KEY TERMS AND DEFINITIONS

**Digital Storytelling:** A new form of storytelling art combining narratives, digital images, audio, and videos.

**Instructional Digital Stories:** Digital stories specifically aimed to be used for teaching course contents.

**Learning Design Process:** A pedagogical framework for learners to create digital stories. It includes pre-production, production, post-production, and distribution phases.

**Schema:** A general knowledge structure that provides a framework for organizing clusters of knowledge.

**Story Grammar:** A framework including the basic elements of a story and the rules that explain the relationship between these elements.

**Story Mapping:** A visual tool showing the facts, thoughts, and relations among the concepts in a story.

# Chapter 24
# Three Uses of Digital Tools to Supplement Engagement and Learning in the College Classroom

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## ABSTRACT

*Despite the widespread use of smartphones, apps, and social media in college students' and instructors' lives, there has been a slow adoption of these digital tools into the classroom. This chapter posits that individuals' online interactions account for a great deal of informal learning and that by integrating these digital tools in our classrooms, instructors can complement and extend the formal learning of their classrooms. Specifically, this chapter offers three ways that technology can assist in the classroom: to promote inclusive participation, to enhance the classroom climate, and to explore and demonstrate course material in an engaging way. To these ends, the authors explore the efficacy of social media sites, Google applications, and GIFs and memes.*



## INTRODUCTION

For all the talk of students' fixations with their cell phones, it is curious that the ubiquitous apps and websites that students—and instructors—use daily are still largely untapped in the college classroom. Eighty percent of 18-to-25-year-olds use Facebook and forty percent of them user Twitter *several* times

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per day (Pew Research, 2018). Technology is integrated into their daily lives and acts a primary source through which they build and maintain friendships and personal relationships (Martínez-Alemán, 2014). Regardless of the concerns the frequent use of technology raises, these digital tools are an inherent part of modern life that account for much of our students' informal learning and interactions with the world.

Given the way these technologies are embedded into many of our students' everyday lives, there exists an opportunity to utilize digital tools in the teaching and learning process. In doing so, instructors blur the line between the informal learning that occurs via the Internet and the formal learning in our classrooms. The authors define digital tools as "software and platforms for teaching and learning that can be used with computers or mobile devices to work with text, image, audio, and video" (Interactive Teaching in Languages with Technology, 2017, p.3). This definition encompasses social media, defined as "technologies that facilitate social interaction, make possible collaboration, and enable deliberation across stakeholders. These technologies include blogs, wikis, media (audio, photo, video, text) sharing tools, networking platforms (including Facebook), and virtual worlds" (Bryer & Zavatarro, 2011, p. 327), which can be accessed in the classroom via smartphones, tablets, or laptops.

Social media's hypnotic lure derives partly from the way it positions individuals as constructors of information and communication, allowing for participation and connection with others not possible with older forms of media (Selywyn, 2012). Similarly, with college classrooms shifting away from instructor-transmitted lectures toward student construction of knowledge, social media offers ways to facilitate more inclusive participation and engagement in the classroom. Students who tend to avoid class participation might feel more comfortable expressing themselves and sharing their opinions through social media, such as Facebook, Twitter, or YouTube (Faizi, El Afia, & Chiheb, 2013).

Despite the affordances technology and social media sites provide in the classroom, higher education instructors have been reluctant to adopt them (Roblyer, McDaniel, Webb, Herman, & Witty, 2010). This is notable given that most instructors use social media in their personal lives (Moran, Seaman, & Tinti-Kane, 2012) and generally report positive attitudes toward social media use in teaching (Ajjan & Hartshorne, 2008). Scott (2013) suggests that a lack of knowledge about how to operationalize digital tools like social media sites in the classroom partly explains the slow adoption and that instructors may require more institutional support to do so. This contention is supported by Rogers-Estable (2014), who reported that extrinsic factors like support and time were barriers to technology adoption by faculty.

Recognizing the need for more support and concrete strategies to integrate digital tools in the classroom, this chapter offers practical, easy-to-implement uses of popular technologies in teaching for both current and future faculty. The following chapter foregrounds how these tools can aid achievement of three specific goals: to promote more inclusive classrooms, to build a positive classroom environment, and to engage with content and demonstrate learning. Care was taken to highlight tools and examples that work well across disciplines and that do not require more than a standard level of technological familiarity.

## CLASSROOM ISSUES THAT DIGITAL TOOLS CAN MITIGATE

The first issue that technology can assist with is the perennial challenge of uneven class participation and engagement among students. Howard (2015) reported that, across a range of class sizes, typically the same five to eight students speak up in class. Women and minority students also tend to participate less in class discussions (Caspi, Chajut, & Saporta, 2008; White, 2011), substantiating the notion that social inequities do not disappear in our classrooms but, rather, are reproduced. First-generation college students, who report lower levels of belonging and greater instances of exclusion, tend to be quieter because they lack social capital and on-campus connections (Schwartz et al., 2018). Extroverts are also more likely to speak in class discussions (Caspi, Chajut, Saporta, & Beyth-Marom, 2006; Furnam & Medhurst, 1995), while participation in online discussions has been found to equalize participation between introverts and extroverts (Blau & Barak, 2012). International students often fear making linguistic mistakes when speaking in class and may not be enculturated into a classroom environment that demands verbal participation (Mori, 2000; Sarkodie-Mensah, 1998). Digital tools, while not a panacea for these problems, offer a medium through which students can express their thoughts with additional processing time and without necessarily verbalizing them. This widens the pool of participation and has added benefits, such as documentation of students' thoughts. For example, when students type responses into a Google Doc, the instructor has a record of their contributions that he/she/they can use as a check on student learning.

Secondly, digital tools can foster a positive classroom climate, which, in turn, promotes student motivation and engagement (Huang, Shen, & Huang, 2018). Two crucial elements of a positive classroom environment are students' interactions with peers and the instructor. Digital tools can promote both. For example, researchers found that teacher disclosure on social media was correlated with students' motivation and comfort in the classroom (Mazer, Murphy, & Simonds, 2007). When teachers share pieces of their personality online, students can identify similarities between themselves and their instructors. As these similarities become visible, students more easily relate to their instructors, which can enhance their comfort in interacting with the instructor. The same principle applies when having discussions with peers using digital formats. In particular, digital communication tools can facilitate controversial and divisive topics that often result in tense and quiet classroom environments. Digital tools provide the time and emotional distancing to make difficult conversations more productive. In a study comparing face-to-face with online text conversations, participants favored the online conversations for sensitive topics (Blau & Barak, 2012). Notably, online chat tools do not only have to be used outside the classroom but can be integrated into class discussions as an additional or alternative form of discussion.

Lastly, digital tools offer an engaging medium through which to explore topics related to coursework and a way to demonstrate student understanding and learning. Traditional online discussion boards on learning management systems (LMSs), like Blackboard or Moodle, can be perceived as impersonal and awkward to navigate. Today's college students prefer more personalized technologies, ones with easy messaging applications that notify their instructor of their questions and comments (Fructuoso, 2014). Furthermore, these digital communications are a rich source of data that can be used to make coursework more relevant and enable learners to see the transfer of course concepts to real life situations. For instance, a course objective to get students to recognize the difference between correlation and causation could be achieved by having students find instances of correct and incorrect uses of it on platforms, such as Twitter, where conclusions are often hastily drawn. Such a use provides students with greater sensitivity to how this concept manifests in the real world and the implications of misunderstandings.

## INFORMAL SOCIAL LEARNING AND SOCIAL MEDIA

The ideas in this chapter share an underlying assumption that learning is enhanced through collaboration with others whereby students develop new understandings and extend their thinking (Berman, 1991), and that digital tools are a potent medium for these informal learning interactions. Throughout our lives, informal learning, which refers to the "experiences of everyday living from which which we learn" (Merriam, Caffarella, & Baumgartner, p. 24, 2007) facilitates more of our overall learning than the formal education that occurs in educational institutions (Banks et al., 2007). Given the frequency of college students' use of social media, their online interactions clearly account for a significant portion of the more pervasive informal learning. In the digital landscape, Facebook posts, blogs, and discussion forums like Quora, Reddit, and Twitter are ways that individuals gather information and exchange perspectives. The abundance of information that is consumed online undoubtedly produces problems, like misinformation, but it also holds great potential for learning and for creating new knowledge. The extent to which one is a consumer or producer online varies from person to person, but at the more participatory end, users engage in interest-driven learning though such means as reading and posting on forum sites, participating in online civic action groups, and fan-fiction writing (Ito et al., 2013). Instructors can take advantage of the ability the Internet allows of creating content to move students from consumers to producers of knowledge using digital tools.

Scholars have posited that these new, prevalent forms of learning are challenging assumptions about education, moving from individualistic pursuits to ones based on exploration, play, and innovation (Thomas & Seely-Brown, 2011). They share a self-directed aspect in which one's online usage is driven by intrinsic motivation and interest. Selwyn (2012) argues that social media can provide a shift toward user-driven education, meaning that students can exert more autonomy and control over what, how, and where they learn. Similarly, Chen and Bryer (2012) see the incorporation of social media into higher education as a way to blur the line between formal and informal learning in meaningful ways. For example, students might extend their formal learning in the classroom by connecting with scholars in the field online or by extending their interactions with classmates after the course ends on various online platforms. Greenhow and Lewin (2016) add an important perspective to the discussion of harnessing informal learning in the classroom by conceptualizing the learning opportunities afforded by technologies as interweaving degrees of formal and informal learning rather than seeing them as a binary. For instance, they detail a class assignment using teacher-directed social media that resulted in students learning a great deal through their informal interactions with each other. These examples are helpful in recognizing that digital tools are complements to, not replacements of, formal learning that can enhance the ever-present potential of informal learning in the classroom that arises from interaction.

## DIGITAL TOOLS TO PROMOTE INCLUSIVE ENGAGEMENT

One of the recognized benefits of the Internet age is that those who have traditionally lacked an outlet to get their voices heard can now do so on a multitude of online platforms. The same opportunity to widen participation exists in our classrooms, where text-based participation modes are easily enabled by digital tools. Most instructors can relate to the problem of a small group of students dominating discussions and answering questions. The reasons for lack of verbal participation vary, from first generation students' unfamiliarity with collegiate culture (Falcon, 2015) to international students' fear of linguistic mistakes (Mori, 2000) and gender dynamics. These disparities in participation highlight an unfortunate truth about how societal inequities manifest themselves in classrooms. And while instructors can never fully remove power imbalances from classroom dynamics, they can mitigate them by providing alternative means of participation.

In particular, the opportunity to submit one's thoughts in writing is a wonderful complement to verbal modes of thought-sharing. It minimizes the fear of linguistic mistakes and allows for additional processing time. In one strategy that works well across class sizes, groups of students work collaboratively on a Google Document to respond to instructor-provided questions during class. In a small class, the entire class might use the same document, which can be simultaneously projected on the board while the instructor is speaking or as an additional component to a class discussion. The document can be set so that students are either anonymous or logged in with their names revealed. Each mode has benefits and downsides that can be weighed by the instructor.

In addition to a collaborative document presenting an alternative form of participation, using Google Doc in this way allows the instructor to assess student learning and clear up misconceptions that arise from their written comments. Instructors also assess and clarify students' spoken contributions, but it is harder for an instructor to catch everything said aloud. A written document has a permanence and precision that can be leveraged to improve student learning, for example, by using it later as a study guide or incorporating it into an assignment. An instructor might ask students to share their document with another group that is then is tasked with responding to comments and questions. Finally, a written document can also provide a form of validation that is often lost to those who, for various reasons, do not speak up in class. The instructor or student can highlight an insightful comment from a quieter student and bring it into the verbal discussion or into her or his presentation. Students are more likely to participate in class when instructors encourage, support, and confirm them (Frisby & Martin 2010), and using Google Docs can help teachers achieve this goal.

The same benefits of text-based communication in class can be achieved through many other platforms. The Google suite of apps, which many schools have built into their email systems, is particularly user-friendly and likely to persist far after other fad technologies lose their popularity. Google Forms is another tool in the suite, similar to polling software, that has the attractive feature of automatically compiling students' responses into a Google spreadsheet and creating charts and graphs from those responses. The instructor can then create a document, which students access via a short link, with questions that can be multiple choice, open-ended, or on a Likert scale, among other options, and project the results, using them as a springboard for discussion or to clear up misunderstandings. This type of automatic mobile polling is well-received by students. In one study on the use of Poll Everywhere, a responseware system in which students can text in answers, 90% of students said the system helped them to learn and was easy to use. Moreover, students reported that the automatic feedback helped them to identify their strengths and weaknesses (Shon & Smith, 2011).

Finally, the online network and microblogging site Twitter can be an alternative communication channel for class discussions. Twitter is widely used in scholarly circles to network and exchange information and resources (Lupton 2014). Scholars also use Twitter to comment and improve upon each other's work and share insights from conferences (Mandavilli, 2011; Li & Greenhow, 2015). Similar uses of academic Twitter can be brought into our classrooms, enabling students to share resources related to the course and provide peer feedback. Twitter has also been found to increase faculty-student interactions and promote engagement by fostering peer discussion and bonding through shared interests (Junco, Heiberger, & Loken, 2011). And unlike more traditional online discussion boards used in college classes, Twitter allows users to infuse their personalities into their interactions (Dunlap & Lowenthal, 2010) and be creative in responding to one another not just with text but also with related news links, images, videos, and GIFs. Blessing, Blessing, and Fleck's (2012) study, in which psychology students were reminded, via tweets, of psychology topics outside of the classroom, documented positive benefits of using Twitter, including increased sharing of insights and questions with instructors. Furthermore, they found that Twitter's use of humorous memes and GIFs helped students recall information more easily.

Another way for instructors to use Twitter is to have a live feed of comments and questions during class lectures and discussions, as is often done at conferences and other academic events. Students can respond to each other, or an instructor can incorporate a tweet into the lecture or discussion. Reyes (2017) found Twitter to be an effective medium for students to submit questions about readings or thorny course topics. He took screenshots of students' questions tweeted at him and included them directly into his teaching presentation, demonstrating to students that he took the time to read their tweets, consider their contributions, and believed their questions were strong enough to initiate or propel the in-class discussion.

Using Twitter in class does imply that all students must have or create a Twitter account. Students could choose to create a private account accessible only to classmates that can be deleted after the course. The use of a unique hashtag allows students to easily find each other's tweets, and the 280- character tweet limit makes reading through contributions manageable while forcing the distillation of complex material into concise remarks. Twitter can also be used to hold online debates, to "show and tell" a link or resource related to course material, and to reinforce important points (Reyes, 2017). For example, an instructor might use Twitter as an exit ticket and ask students to tweet out their main takeaways from a day's lessons, which would be automatically shared with classmates following the hashtag, allowing for robust, immediate sharing of many voices at once, a task which is hard to accomplish through verbal participation.

The strategies mentioned above offer additional means for students to contribute to class and illustrate how the formal learning of lessons can be enhanced through informal, social interactions using digital tools. Instructors who worry that quiet students will become reliant on technology to engage in class should see these alternatives as a way to build students' verbal participation capabilities. The authors have seen that the support and validation that students receive by first contributing to a discussion in a more comfortable mode can lead to increased verbal participation. As Thiet (2017) explained, when instructors can help students feel more confident in their class contributions, their motivation to learn, willingness to take risks, and authentic expression will increase. Even for students who are inclined to speak in class, certain topics may be harder to discuss due to their sensitive nature, in particular political and social topics that elicit strong emotions. Researchers have found that both students and instructors reported feeling uncomfortable when controversial topics were discussed in class (Philpott, Clabough, McConkey & Turner, 2011). Thus, instructors might find that using Google Docs, Twitter, or other digital tools like polling systems can bring more voices into the conversation and help alleviate the tension of discussing contentious topics.

## DIGITAL TOOLS TO IMPROVE CLASSROOM CLIMATE

The increased inclusivity of alternative modes of participation is just one way that digital tools can improve classroom climate. Instructor use of digital tools and self-disclosure on social media send a welcoming message to students. A study by Stowell, Addison, and Clay (2018) found that students rated instructors with technology-friendly policies more positively on rapport scales compared to those who discouraged the use of technology, and Mazer et al. (2007) found that teacher self-disclosure on social media was correlated with students' increased anticipation of motivation and positive classroom climate. They argued that teacher self-disclosure on social media sites has a positive effect, similar to using humor or personal stories in the classroom. Additionally, Chen and Bryer's (2012) research highlighted how social media minimizes the usual barriers between teacher and students to create an open, transparent, and democratic classroom community. These studies suggest that digital tools like social media humanize the instructor, whom students often think of as an intimidating and authoritarian expert. By bringing digital tools into the classroom, an instructor can personalize their teaching, break down communication barriers between students, and forge relationships that drive student engagement and motivation.

Instructors can incorporate memes and GIFs (Graphic Interchange Format) to improve classroom climate and student engagement. Memes are mashups of text and an image that provide commentary, often using humor and subversion, and GIFs are moving animated versions of memes on short loops (Dean, 2018). Not to be written off as a mindless youth trend, these digital tools are used by many people on a daily basis, and they are recognized as significant means of transmitting and enacting politics (Dean, 2018). Memes also have become a means of emotional expression and catharsis for millennials because of how they frequently communicate themes of depression and social anxiety (Krishan, 2018). While scholars may be skeptical of GIFs and memes, the authors would urge them to see these tools as an emergent form of popular discourse and youth expression whose pervasiveness can be harnessed in the classroom. Taking a larger view, scholars can study memes as pulses of societal trends and cultural change. Like any other form communication, they are worthy of serious study. Where Internet users go, scholars should follow, not just to better understand digital culture but to bring the insights these new forms of communication provide into the classroom (Shifman, 2014).

Reyes, Kaeppel, and Bjorngard-Basayne (2018) have used these less-researched yet ubiquitous digital tools to foster a sense of community even before the first day of class. For example, they have students identify a GIF, meme, or image that represents an aspect of their identity and upload it to a Google Slide or Doc prior to the first day of class. Then, on the first day of class, students get into small groups to show and discuss the images they chose while the instructor projects them on the board. The authors noted that "not only do students seem to connect with each other faster with this technique, the humor of the GIFs/memes appear [sic] to reduce anxiety and create [sic] a lighthearted, comfortable classroom environment" (para. 2). The authors have seen that the images often allow students to find commonalities either because they relate to the GIF or meme or because it shares a cultural reference point. In addition, it provides unique insight to the instructor that would likely get lost in verbal introductions. For example, the authors have seen how students often choose GIFs or memes that highlight how busy, overworked, broke, or anxious they are—helpful information for an instructor to keep in mind.

GIFs and memes can also be used at other points in the semester, for instance to check in with how students are feeling about the material. While it might be nerve-wracking for a student to admit confusion aloud in class, sending in a GIF of a confused face to an in-class polling system is less intimidating than transmitting the same feedback verbally. The check-in can be done through polling software like Google Forms or Poll Everywhere by asking students to submit a few words or an emoji to describe their attitude or comprehension of the material. This is more effective and inclusive than typical questions like "Is everybody with me?" and "Does that make sense?" which Watkins (2019) pointed out are likely to result in silence. However, while the check-in technique is helpful in gauging the room, it does not address overconfidence bias; thus it is important to use other formative assessments of student knowledge (Watkins, 2019).

Digital tools not only promote a better classroom environment, they also lead to a reimagination of the classroom space because they can extend traditional boundaries. In an article on using social media and digital tools in the classroom, Arendale (2017) discussed his embrace of Google's App Suite (Gmail, Drive, Sites, Hangout, etc.) to promote accessibility, engagement, and academic enrichment. Using Google Sites, he created online study guides, eventually inviting students into the process so that the materials were more student-centered and better addressed student anxieties about particular topics. The traditional textbook was thrown out and replaced with a website that housed the course readings that were crowdsourced from other instructors and his students. His use of a digital tool exemplifies a point made by Chen and Bryer (2012), that social media sites related to the course can help create a classroom community and collective intelligence. By tapping into scholarly communities or integrating online work into the course using digital tools, the boundaries of the classroom extend beyond its walls to provide ongoing informal learning opportunities and engagement.

Finally, classroom climate can be enhanced by validating students' digital contributions. Goodboy and Myers (2008) found that students who perceived instructors as affirming were more likely to report increased communication and participation and greater cognitive learning, as well as satisfaction. For students who are quieter in class, the opportunity to get teacher validation from class contributions is infrequent, but through the widened participation afforded by technologies, these students can experience both teacher and peer validation. Depending on the digital platform used, this might come in the form of upvotes, likes, affirmative responses to a post, and so on. On a site like Quora, where individuals post answers to a question, people can upvote the best responses, which typically results in the highest quality answers being most visible, a feature that could be adopted in the classroom through use of Quora or similar sites. Instructors can also bring attention to student contributions by showcasing them on their accessible social media. For example, Williams and Whiting (2016) described how a business professor used Twitter to highlight student accomplishments. Student comments can also be incorporated into class slides or other materials and used as a springboard for discussion or clarification. These examples highlight how digital tools can help break down the barrier between instructor and students in ways that build rapport and foster a classroom community.

## DIGITAL TOOLS TO EXPLORE AND DEMONSTRATE COURSE CONTENT

The popularity of memes, GIFs, and social media sites can also be leveraged to explore course content or to show students how a course topic manifests in society. For example, an instructor teaching a course that explores concepts like race or cultural appropriation could have students analyze GIFs and memes that represent African Americans or tweets about African Americans. One example is "digital blackface", the reaction shots of people of African descent often found online in GIFs or memes. Whether they are GIFs of Oprah Winfrey or the Real Housewives of Atlanta, black bodies, especially those of black women, are a common way to express a user's thinking (Jackson, 2017). An instructor can bring images that are already so common in students' digital lives into the classroom to ask if the use of black people's expressions taps into the long history of racial buffoonery or blackface minstrelsy. Used in this way, memes and GIFs become primary sources for analysis in a modern classroom.

Memes and GIFs can also be analyzed to explore cultural norms, such as conceptions of masculinity, as is evident in the popular "Crying Michael Jordan" meme. The meme depicts the basketball legend in an emotional state, with tears visibly running down his face, during his 2009 Basketball Hall of Fame induction speech. At first, the meme was used to express genuine disappointment at a sport team's defeat. Over time, the meme was repurposed for every type of defeat, sporting or otherwise, as well as to mock those upset about the defeat. Instructors could use memes, like any other primary source, as a jumping off point for larger debates about our cultural norms and values. For instance, a screengrab of the early 2000s television character Dawson Leery in tears over a breakup with his longtime partner has spawned not just thousands of "crying Dawson" memes but full websites that poke fun at the meme. Such an example could be used to raise the question of who is allowed to express emotions, and how, in our society. These cultural artifacts make for an interesting complement to more standard course materials in ways that are likely to engage students as they bring into the classroom elements of discourse from students' online lives. Some have even posited that forms of online communication are new literacies (Greenhow & Gleason, 2012) and that internet memes have become a form of rhetoric (Huntington, 2013).

Other instructors have discussed using GIFs to teach students vocabulary. For example, a GIF of two cute Corgi puppies walking together on a treadmill is used to explain what a "companion" is (Akers, 2018). While this particular example was taken from the K-12 educational setting, it is not hard to see how a similar strategy could be applied for more difficult, college-level concepts. One educational website of animated GIFs shows how many scientific processes unfold, for example, how a human face forms inside the womb (Bored Panda, n.d.). The same demonstrative properties are also found in memes; the internet abounds with memes used to explain concepts in an engaging, fun, and memorable way. Simply search for a discipline and memes and you will likely come across dozens, if not hundreds, of images. For instance, there is an active Facebook community dedicated to memes on statistics that, in addition to being fun, illustrates significant concepts in the field, lending themselves well to an instructor's slides.

Reyes et al. (2018) have suggested using the increasing complexity of learning tasks in hierarchies like Bloom's taxonomy to move students from consuming internet artifacts like memes and GIFs to creating their own as a way to demonstrate their understanding of a course concept. For example, students can demonstrate their understanding of a concept like double standards for genders by creating a meme or GIF that shows, say, a flirtatious man and woman with one being labeled "slut" while the other is labeled in a positive way, such as "baller." In another example, Akers (2018) suggested tasking students with creating a meme that represents the emotions or perspective of literary character. This could be done in history classes as well. With easy GIF-making websites, students can also create in-class GIFs of themselves solving a math problem, which can then be shared with other students as a form of peer learning (Akers, 2018). In this way, meme and GIF construction can functions as an informal and fun assessment technique. They also produce materials that can help other students understand course concepts.

Finally, the Internet can be used to engage with one's career field or the scholarly community of a discipline. Williams and Whiting (2016) found that business students were hungry for more real-world examples and that online professional communities can be a good source of these. Chen and Bryer (2012) noted how the career networking site LinkedIn can be integrated with course content and demonstrate learning by having students engage with a professional in their field or the field of the course and then write up a reflection on what they learned. While their example comes from a business course, and Linkedin may be a more obvious tool for business, marketing, and communications classes, it can also be used effectively to engage with professionals across disciplines. Students can connect what might be abstract concepts to their application in the field and network at the same time. This increases the relevance of lessons and encourages students to build a professional online identity. Slone and Gaffney's (2016) research on LinkedIn and business communication students documented that teaching exercises can include learning the best practices for a creating and maintaining a professional online identity, analyzing how students' current identity could affect job prospects, and then revising their online profiles to meet the standards of different employers. Besides posting on Linkedin, students can contribute to online blogs, Wikipedia pages, and other crowdsourced pages or communities that connect to the subject matter at hand. By engaging with course content outside of the classroom and demonstrating their understandings through social media and other technologies, students can build academic capital (Valenzuela, Park, & Kee, 2009).

## LIMITATIONS OF DIGITAL TEACHING TOOLS

Undoubtedly, there are a host of concerns about the use of digital tools in the classroom, ranging from privacy to a more extreme worry about a loss of literacy through the increased use of social media (Stewart, 2015). These fears reflect a truth that is universal to the implementation of any pedagogical tool: their value will only be as great as the intention and thoughtfulness with which they are incorporated into the classroom. For instance, some researchers have found that students' use of social media for class resulted in superficial interactions (English & Duncan-Howell, 2008). The same superficiality can be seen in traditional learning management system discussion boards, thus illustrating that it is not the medium but the instructional design underlying their use that matters. Higher order learning and knowledge construction require careful instructional planning, well-designed prompts, and structured guidance (Andresen, 2009).

The careful crafting required of teachers raises another common concern: lack of faculty time to incorporate new digital tools in their classrooms (Chen & Bryer, 2012). Faculty may be intrigued to use these tools but lack the knowledge of how to implement them practically. Further, younger faculty may feel more comfortable in adopting new technologies (Scott, 2013), whereas older faculty might have less self-efficacy toward technology in teaching. Indeed, in the autonomous environment of higher education institutions, teachers shoulder the burden of having to self-direct themselves to learn to implement new instructional strategies in the classroom. One study found that when teachers were supported to implement technology in a school-wide effort, they were more knowledgeable about how to use new technologies, as compared to a group of teachers who worked with individual facilitators to utilize the new technologies (Edwards-Groves, 2011). Thus, the authors encourage instructors to seek out and request assistance from experienced peers and their campus resources. University and college teaching centers are critical, playing a supportive and facilitative role as instructors learn to use digital technologies more effectively. In the absence of such support, experimenting with a new digital tool by starting small and slowly is a good entry point. The instructor can be transparent with students that this is an experiment and that their feedback will improve its use in the future.

Lastly, instructors might worry about students' perception of using digital tools like social media in the classroom. Although many studies show positive perceptions by students (McArthur & Bostedo-Conway, 2012; McCole, Everett, & Rivera, 2014; Shon & Smith, 2011), no technology will ever be fully endorsed by all students, nor will all classroom activities or other course components. It also bears remembering that not all college students are young students who are familiar with the digital tools and social media sites mentioned in this chapter. One in five undergraduate students is over 30 years old (Nadworny & Depenbrock, 2018), and they use and embrace digital tools differently than younger students. But regardless of age and demographics, students generally respond well to instructor transparency, authenticity, and humility — all of which can help them ease into using new technologies. What is critical is articulating the pedagogical purpose of any tool—digital or otherwise—and providing support to use it in meaningful ways and modeling how to do so (Stewart, 2015).

## CONCLUSION

Students and instructors alike live in a world rich with digital tools such as the social media sites they scroll through daily, but many overlook how they act as a major source of our informal learning. This chapter aimed to increase instructors' knowledge of some of the more durable digital tools that can be used to supplement and extend the formal learning already occurring. The authors positioned technology as a tool to mitigate three challenges in the classroom: lack of wide participation, a stiff classroom climate, and a need for engaging, relevant ways to explore course content. Instructors who adopt digital tools enable their students to participate in alternative ways that can democratize the classroom, as well as to exhibit their personalities and interests. Further, by tapping into the digital landscape, we can make connections to the way our course content manifests and is discussed in our culture. Digital tools like smartphones and social media are here to stay, reshaping the way people communicate, consume, and share information. Rather than ignore or resist them, instructors can harness their potential and use them to their benefit provided they do so with careful implementation and alignment with the sound pedagogy.

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# Chapter 25

# An Urgency for Change in Roles:

## A Cross Analysis of Digital Teaching and Learning Environments From Students and Faculty Perspective

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## ABSTRACT

*Student dependence on technology, higher education institution efforts of digitalization in teaching and learning, along with the faculty member hesitancy to adopt innovative technologies all contribute to current challenges in higher education. The focus of this chapter is on exploring the gap between student and faculty perceptions about utilizing technology in teaching and learning, in addition to enlighten institutional roles and strategies to sustain efforts for managing such environments and faculty development. Multiple research methods are used to derive insights. The findings point towards the need to increase knowledge base and to expand faculty development around digital teaching and learning strategies as well as fostering student faculty collaboration to improve learner engagement and performance. As a result of changing roles, the pedagogical methods and technological tools used in digital teaching and learning process should not be a sole decision of the institution, but as a result of a collaborative mindset of institution, faculty, and students.*

## INTRODUCTION

Present challenges facing higher education embrace efforts for enhancing student engagement via Digital Teaching and Learning (DTL) environments, along with empowering faculty members who have been hesitant to adopt new learning approaches. Researchers are beginning to focus on student engagement as a means of overcoming student dissatisfaction. Delialioğlu (2012) defines student engagement as involving students in meaningful academic activities by designing learning environments and utilizing engaging teaching practices.

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There is an increase in the use of digital technologies for learning purposes (Henderson, Selwyn, & Aston, 2015; Lai, Wang, & Lei, 2012; Poon, 2013). Some study observes a significant relationship between students' use of technology and their achievements (Al-Hariri & Al-Hattami, 2017). As revealed, by US Public Sector Education Director at Cisco, Renee Patton (2018) "It's now easier for students to engage on their own terms - whether online, hybrid, or flipped - and no longer having to travel across campus for every single meeting makes it easier for leaders and faculty members to work together, too." These encourage to review and recognize the changing roles of students in a variety of digital teaching and learning environments that they are comfortable with; which leads to the need of investigating the technology usage perceptions from both students' and faculty perspectives.

On the other hand, faculty technological competencies are affecting students' perceptions (Malechwanzi, Lei & Wang, 2016). Collaço (2017) also suggests "teachers need to get students actively involved in their learning experience by incorporating relevant, and enjoyable activities that promote student-teacher interaction, and student teamwork" (p.45). "For both students and teachers, ubiquitous connectivity facilitates greater collaboration, enabling people to develop increasingly connected communities in their chosen fields. Being more available to students can also empower teachers to deliver more innovative, exciting lectures, whether face-to-face or online, while offering more personalised feedback and mentoring." (Patton, 2018)

Students' growing unwillingness to learn in traditional classes (Moore, 2007) coupled with faculty reluctance to use educational technologies (Tallvid, 2016) raises the importance of examining the nature of this gap between students and faculty in higher education. From both perspectives, Bond et.al. (2018) suggests hybrid systems to integrate institutional and external technological tools that will enhance teaching and learning processes for better student acceptance.

Motivation for faculty to integrate digital teaching and learning environments can be encouraged through professional development offerings, modeling best and innovative practices of technology usage both inside and outside the classroom. Faculty competency that lacks may strongly have been as a result of the institution's overall approach to promote the use of technologies for teaching. However, few studies in the literature consider students' and faculty members' perceptions at the same time which is important.

The focus of this chapter is exploring the gap between students and faculty about utilizing technology in teaching and learning for enlightening institutional role and strategies to sustain efforts for managing such environments and faculty development. First, digitalization in higher education which, results in an extensive use of innovative information and communication technologies for the support of teaching and learning will be discussed. It will be followed by review of literature of Technology Enhanced Learning (TEL) environment use by students and faculty. Next, there will be a brief review of faculty development efforts in higher education institutions for technology use in teaching and learning. A case in a private institution will be investigated where multiple research methods are used to derive insights. Finally, the findings of the research will be discussed which point towards the need to increase knowledgebase and to expand faculty development around digital teaching and learning strategies. The chapter concludes with suggestions to narrow this gap between students and faculty members; to adequately emerge potential institutional strategies by identifying their perceptions about the usage of digital technology environments as well as future needs.

## BACKGROUND

### Digitalization in Higher Education

Internationalization, more stringent accreditation and changes in student profiles are some of the main global issues that characterize the new dynamics of higher education. The entrance of millennials into higher education triggered; intensive use of technology for teaching and learning and to equip the skills that will provide success in the 21st century. Van Laar, van Deursen, van Dijk and de Haan (2017) categorizes the dimensions of 21st-century digital skills framework with *core skills* (technical, information management, communication, collaboration, creativity, critical thinking, problem solving) and *contextual skills* (ethical awareness, cultural awareness, flexibility, self-direction, lifelong learning). However, both the arrival of the next generation, the Gen Zers born after 1996, who grew up using Internet and education sector gearing up towards Industry 4.0 are further enforcing the necessary changes for digital teaching and learning strategies in higher education. "The very nature of Higher Education, how it is delivered and the role of universities in society and the economy is changing, and will continue to change significantly in the next decade." (PwC, 2018) This significant change that is mentioned will not only change the role of universities, but the role of teachers and students. Even, Jeladze and Pata remark to "use the conceptual model of a smart, digitally enhanced learning ecosystem to describe the schools and their dynamic interaction with the environment, as well as inside the organization." Which is referred to a complex network or interconnected system within and external to the higher education institution as an organization.

Finally, the role of the institutions for preparing, maintaining and supporting digital environments for both students and faculty cannot be neglected. Due to the success of many digital learning models, the importance of creating suitable environments is recognized even by traditional higher education institutions that seems to prefer longstanding teaching and learning approaches.

The Higher Education Founding Council for England (HEFCE, 2009) emphasized the institutional necessity to determine the most effective ways to develop teaching, learning, and assessment using technology; compatible with institutions' infrastructure and practices. In the recent years, it is observed that online teaching and learning have made remarkable progress globally (Reilly, Gallagher-Lepak & Ralston, 2012). One of the motives is that online education creates many new possibilities for higher education to develop digital learning models which disseminate accessible education and learning resources to distant locations expanding access to universities (Altbach, Reisberg, & Rumbley, 2009; Shea, Li, & Pickett, 2006). The change of moving to online learning environments and its effect on the institution, administrators and faculty were discussed by Yalçın-Tepe and Adıgüzel (2017). They have identified some of the reasons for faculty not having an ideal positive approach to distance education; the distance education methods and concepts are not yet clearly understood by faculty and students; faculty do not have enough information about teaching via distance education specifically purposeful design of courses and preparation of the content of the distance education courses to be taught causes an extra burden on the faculty.

As well, an OECD report developed by Hénard and Roseveare (2012) to guide higher education institutions, university leaders and practitioners aimed to encourage "Quality Teaching" of digital era so ways of leadership and collaboration is provided to address tensions between innovators and others reluctant to change. Natow, Reddy and Grant (2017) identified the three different categories of technology use in developmental education in US public colleges: instructional technology, course management technology, and student support technology. Casanova, Moreira & Costa (2011) suggested five dimensions must be considered to evaluate the "Quality of Technology Enhanced Learning", where one of them was logistics and support, the logistics and equipment needed for Technology Enhanced Learning (TEL) environment and the support given by the institution to provide tools, helpdesk and training. These studies all stated institutions' challenging role on effective use of TEL environments.

These initiatives within higher education will help institutions to focus on faculty integrate digital tools and equip required skills to students as a means to develop enhanced and effective digital teaching and learning environments inside and outside classroom.

## Students Use of TEL Environments

Students usage of technology for learning purposes are also investigated in many research. Lai et al. (2012) found that praise and support from peers and teachers, and their attitudes toward technology use were the factors that influence students' adoption of technology for learning purposes. Poon (2013) noted some benefits of online education for enhancing student learning experiences such as: improved student learning outcomes, greater flexibility for students and teachers, enhanced autonomy, reflection, and research skills, reduced student withdrawal rate, ability to foster a professional learning environment, and potential cost and resource savings. Similarly, flexibility of time and place, ease of organization and management of study tasks by replaying and revisiting teaching materials, and opportunity to learn visually were identified within 11 distinct benefits in a study by Henderson et al. (2015). These benefits show that the students mainly use technology for fulfilling the requirements of logistical aspects of the learning process.

The challenges were reported as unrealistic student expectations, student-perceived isolation, technological problems for students, invasiveness into other areas of life, time commitment, institutional technological problems, and difficulty in acquiring new teaching and technology skills (Poon, 2013). As well as, according to Malechwanzi, Lei and Wang (2016) students' perceptions towards technology use are influenced by faculty competencies. If faculty cannot implement new technologies effectively, student blame the technology for not learning. Another study exploring digitalization of higher education from the students' point of view concludes with their claims; using TEL will facilitate to focus on the content of their studies, to support organizational difficulties, and to provide easy access to resources with a little effort (Thoring, Rudolph, & Vogl, 2017).

## Faculty Use of TEL Environments

It is mainly faculty members' role to integrate TEL environments into undergraduate education. Reed (2014) investigated the attitudes and experiences of faculty in relation to specific uses of technology in teaching and learning. His results demonstrated that faculty in general are interested in creating a consistent virtual learning environment that primarily include online assignment submissions, grading and feedback, but are less interested in video recording lectures. Another study by Allen and Seaman (2012) explored the technology use in USA and determine faculty preferences within innovative technologies as: e-books, videos, simulations, and digital media usage. The results show that while most of them use pre-existing digital materials, 43% of faculty members report developing their own digital educational materials, open educational resources, and lecture videos for their courses. They also remarked social media usage for interaction with students and colleagues was not been that popular at that time. Faculty members expressed the benefits of using technology in increase of their productivity, creativity, and connection to the academic community and students. About Learning Management System (LMS), the most common use was to store and distribute syllabi and materials and communicate with students and record grades. The use of other functions was relatively low. It is worth mentioning that, in this study more than 60% of faculty have reported that they were excited about e-books and e-resources that could replace traditional books.

Bilgiç, Doğan and Seferoğlu (2011) reported that faculty have described their main concerns in online education as the need of pedagogical and technical support as well as content preparation. Some of the limitations expressed were lack of time, required skills, and support (Reed, 2014).

These various types of technology usage by faculty aims to ensure students' engagement to learn in digital environments. Motivation for faculty to integrate digital teaching and learning environments can be encouraged through professional development offerings modeling best and innovative practices of technology usage both inside and outside the classroom.

## Faculty Development Efforts

A wide-ranging series of faculty development programs are required to support faculty initiate the transition towards new digital teaching and learning environments. These programs vary between higher education institutions and countries. Studies conducted in different countries report that the most important step required for this transition is to increase faculty knowledge and skills in use of technology (Eddy, 2007; Elçi & Yaratan, 2012; Odabaşı, 2003). Even this may not be sufficient, since McQuiggan (2007) specifically uncovered the needs for faculty who would be able to teach online courses. Gregory and Salmon (2013) stated that contextualization, incremental innovation, and mentoring the conveners make professional development for online teaching effective, and sustainable. Also, McQuiggan (2012) discussed that learning to teach online may provide an opportunity for faculty to reflect on and evaluate their current teaching approaches and suggested that faculty developers should design programs based on adult learning theories to trigger change, in place of one-size-fits-all programs. Another study proposed a virtual faculty learning community for an effective faculty development program (Reilly et al., 2012). Where the importance of skills, knowledge, attitudes and expanded faculty roles towards e-learning are emphasized. Villar Angulo and Alegre de la Rosa (2007) reported an innovative online faculty development program leading to behavioral change. According to Herman (2012)'s study in USA, there were 25 different types of faculty professional development programs which included institutionally-supported or self-teaching opportunities, with quality assurance evaluation programs. These programs are now expected to assist and support faculty for integrating TEL in their teaching.

Almpanis (2015) mention that faculty development activities in Technology Enhanced Learning (TEL) became gradually important for the institutions. Most universities that participated in their survey claimed to have a variety of faculty development programs that covers a series of skills and pedagogical considerations of various learning technologies. Diehl (2016) comments that the two keys to success in higher education institutions are learner-center faculty development programs and competent instructors. Kolbo and Turnage (2002) emphasize that "to change teaching styles" using technology and to share teaching experiences to enhance academic excellence are some goals of faculty development initiatives. Diaz et al. (2009) suggests 21$^{st}$ century faculty development program to be "valuable, relevant, current, and engaging" since "faculty members are learners with needs and constraints similar to those of students." Faculty development initiatives may not only help faculty to reflect on their way of teaching but also provide insight to different models of doing.

## Research Questions

The purpose of this research is to investigate their students' and faculty members' perceptions of the current TEL methods, tools as well as future needs. Student and Faculty perceptions and competencies are examined and compared in a cross analysis. In order to find the gap between the current level of faculty usage of digital technology and proficiency with TEL, compared to the current level of student usage and proficiency with TEL, along with their preferences for future change, the study attempts to answer the following questions:

1. Which TEL methods and tools do the students currently use for learning, and faculty use for teaching?
2. What is the impact of student status (schools, year of study), and faculty status (schools, academic position, teaching experience, attendance to faculty development events) to their technology skills and technology usage level?
3. Which TEL methods and tools are the ones that faculty like to use for teaching, and students for learning in the future?
4. What is the relationship between students' perceptions of the effectiveness of utilizing TEL for their learning, and faculty usage of digital technology and their competency with TEL?

## METHODOLOGY

An in-depth and mixed methodology was designed to answer the research questions. Our methodology consists of qualitative and quantitative approaches, data collection, and data analysis at various stages of the research. Two online surveys were designed for the study.

The Students' Usage of Technology Enhanced Education (STUTEE) Survey was developed for students. First part of the survey collects data on demographics, academic standing, school, major, course delivery methods used, and technology skills and experience for learning. There were total of 13 questions. Researchers added four open-ended questions to gather student perceptions in benefits and challenges of using TEL in learning.

The Faculty Professional Development for Technology Enhanced Education (FPDTEE) Survey was designed and developed for faculty members. The first part of the instrument consisted of demographics of participants such as academic position, school, teaching experience, course delivery methods, technology skills and experience for learning, and faculty development participation status. There were 12 questions on the survey, three of which were designed to be open-ended. The open-ended questions in both instruments that form the qualitative inquiry, were also structured to detect the perspectives of faculty and students for improving future teaching and learning environments.

In addition to the instruments to collect data, multiple interviews with lead faculty and administration in digital technology enhancements were also conducted to collect the experts' view on the current status que, and requirements for future conducts. Views along with the collected data from the instruments help to control for outliers and calibrate the results.

The research study was approved by the University Human Subjects Review Board (HSRB), and the institutional research ethics board. The data of FPDTEE and STUTEE were collected through Qualtrics Survey software and imported to IBM SPSS v22 and QSR NVivo v10 for further analysis. The analysis of the quantitative data was done using descriptive statistics, Kruskal-Wallis analysis of variance, and independent group T-tests. Statistical tests were used to identify meaningful differences between faculty and students for every control category with respect to TEL.

In order to conduct the qualitative analysis, all the open-ended questions in FPDTEE and STUTEE were imported to NVivo. Theme identification was used for further analysis. This method is one of the most fundamental tasks in qualitative research (Ryan & Bernard, 2003). An analysis of words is conducted, a careful reading of larger blocks of texts, and an intentional analysis of linguistic features. The literature presented earlier in this study pointed to some of the themes observed in the past. The open-ended questions and the interview transcriptions were analyzed to identify additional themes. Open-ended questions and interviews were coded in NVivo to identify nodes as themes. During the coding some reference nodes are introduced; however, no pre-determined new nodes were added to the model. The nodes that were not referenced were later eliminated. Nodes were analyzed for frequency distributions and were examined to explore the results related to the themes.

## Data Collection and Preliminary Results

The sample of the project consisted of students and faculty of a private liberal arts university in USA private university. The links to the surveys were distributed electronically to all students and faculty via emails. Respectively STUTEE and FPDTEE survey were completed by 207 students and 142 faculty members. Table 1 displays the distribution of faculty demographics. The majority of the participants were full-time faculty members (68%) and part time faculty constituted 32%.

Distribution of student demographics according to STUTEE responses are also shown in Table 1. The majority of the participants were freshmen (32%) followed by juniors (18%). The majority of participating students (40%) were from the College of Arts and Sciences. The percentages of other participating students were as follows: School of Business (20%), School of Justice Studies (12%), School of Education (10%), School of Architecture, Art and Historic Preservation (8%), and School of Engineering (7%).

*Table 1. Demographics of faculty and students*

| | **Faculty** ($N$ = **136**) | | **Student** ($N$ = **164**) | |
|---|---|---|---|---|
| | **N** | **%** | **N** | **%** |
| *School* | | | | |
| Arts and Sciences | 61 | 45 | 66 | 40 |
| Business | 17 | 13 | 32 | 20 |
| Continuing Studies | 14 | 10 | 1 | 1 |
| Architecture, Art and Historic Preservation | 11 | 8 | 13 | 8 |
| Engineering, Computing and Construction Management | 9 | 7 | 12 | 7 |
| Law | 9 | 7 | 1 | 1 |
| Justice Studies | 7 | 5 | 19 | 12 |
| Education | 5 | 4 | 17 | 10 |
| Other | 3 | 2 | 3 | 2 |

*continues on following page*

*Table 1. Continued*

| | Faculty ($N$ = 136) | | Student ($N$ = 164) | |
|---|---|---|---|---|
| | **N** | **%** | **N** | **%** |
| *Course Delivery Methods* | | | | |
| In Class | 118 | 87 | 162 | 99 |
| Online | 63 | 46 | 33 | 20 |
| Blended/ Hybrid | 60 | 44 | 10 | 6 |
| *Faculty Academic Position* | | | | |
| Full time | 91 | 68 | | |
| Part time | 43 | 32 | | |
| *Faculty Teaching Experience* | | | | |
| 0-5 years | 27 | 20 | | |
| 6-10 years | 21 | 15 | | |
| 11-20 years | 54 | 40 | | |
| Over 20 years | 34 | 25 | | |
| *Faculty Development Participation* | | | | |
| In University | 92 | 69 | | |
| Out University | 46 | 34 | | |
| No | 29 | 22 | | |
| *Student Academic Standing* | | | | |
| Freshman | | | 52 | 32 |
| Sophomore | | | 36 | 22 |
| Junior | | | 30 | 18 |
| Senior | | | 46 | 28 |
| Graduate Student | | | 0 | 0 |
| Continuing Education | | | 0 | 0 |

Nearly all of the participating students (99%) stated that they have attended the face-to-face course delivery model. The participants who have attended fully online courses comprised 20%, and those participating in blended/hybrid courses comprised 6%. This indicates that many faculty still practice instructing and many students still are educated in traditional classroom teaching and learning environments.

The majority of participating faculty members (45%) were from the College of Arts and Sciences. This school is the largest at the University with the most faculty and respondents represent around 20% of the faculty in their school. Participating faculty members from School of Business and School of Engineering represent 25% of their schools' total faculty members. Full-time participants from these two schools represent more than 40% of their total full-time faculty members.

More than half of the participants had more than 10 years of teaching experience, where 40% of faculty had 11 to 20 years. Different types of course delivery models used by participants were 87% in class, 46% online, and 44% blended/hybrid. Another status item indicated the attendance of faculty in professional development programs, seminars, and workshops. According to this question, 69% of participants attended activity within the institution, 34% attended activity outside the institution and only 22% of the faculty respondents had not attended any faculty professional development activity.

## FINDINGS AND DISCUSSION

In this section, the findings from the surveys and in-person interviews are presented and discussed. The first two sections in Table 2 and Table 3 display the TEL opportunities provided by the university. The third section lists the tools that are available outside the institution which are preferred by faculty and students.

### Student Use of TEL Environments

The descriptive statistics as well as statistical analysis of STUTEE survey results are summarized in Table 3. The two most common tools among students are the LMS and library databases. Students use library databases (70%) at a marginally significant higher level than faculty members (59%). The other preferences are different. More than half of the students use Turnitin, an academic plagiarism detection software. The faculty members can optionally integrate this tool into the LMS assignments. More than

*Table 2. TEL methods/tools used by the faculty*

| | N | % |
|---|---|---|
| *Tools Provided by University (N = 138)* | | |
| LMS | 133 | 96 |
| Library databases | 81 | 59 |
| Panopto | 62 | 45 |
| Turnitin | 58 | 42 |
| GoToMeeting/GoToTraining | 55 | 40 |
| *Tools embedded in LMS (N = 137)* | | |
| Syllabus | 113 | 82 |
| Roster | 110 | 80 |
| Assignments | 109 | 80 |
| Resources | 108 | 79 |
| Announcements | 99 | 72 |
| *Additional Tools (N = 94)* | | |
| Publisher materials | 34 | 36 |
| Collaborative file sharing (e.g. Goggle Drive) | 34 | 36 |
| e-books | 34 | 36 |
| Portable devices | 27 | 29 |
| Personal website | 20 | 21 |

*Table 3.TEL methods/tools used by the students*

| | N | % |
|---|---|---|
| *Tools Provided by University (N = 164)* | | |
| LMS | 160 | 98 |
| Library databases | 115 | 70 |
| Turnitin | 91 | 55 |
| rCloud (virtual desktop) | 43 | 26 |
| Clickers | 26 | 16 |
| *Tools embedded in LMS (N = 162)* | | |
| Assignments | 152 | 94 |
| Gradebook | 135 | 83 |
| Resources | 129 | 80 |
| Syllabus | 121 | 75 |
| Announcements | 113 | 70 |
| *Additional Tools (N = 126)* | | |
| Collaborative file sharing (e.g. Goggle Drive) | 73 | 58 |
| Social Networking Sites | 62 | 49 |
| e-books | 43 | 34 |
| Portable devices | 42 | 33 |
| Personal website | 37 | 29 |

Table 4. Relationship between faculty members' technology skill levels and their schools

| | N | Technology skill levels | | df | Sig |
|---|---|---|---|---|---|
| | | Mean rank | Chi square | | |
| *School* | | | | | |
| Architecture, Art and Historic Preservation | 11 | 76.68 | | | |
| Arts and Sciences | 61 | 68.07 | | | |
| Business | 16 | 74.34 | | | |
| Continuing Studies | 14 | 62.89 | | | |
| Education | 5 | 68.10 | | | |
| Engineering, Computing and Construction Management | 8 | 74.00 | | | |
| Justice Studies | 7 | 59.07 | | | |
| Law | 9 | 26.06 | | | |
| | | | 15,323 | 7 | 0.032* |

Table 5. Relationship between faculty members' technology usage and their status

| | N | Technology usage | | df | Sig |
|---|---|---|---|---|---|
| | | Mean rank | Chi square | | |
| *Status* | | | | | |
| Full-time | 91 | 75.34 | | | |
| Part-time | 44 | 52.83 | | | |
| | | | 9,922 | 1 | 0.002* |

Table 6. Relationship between students' technology skill levels and their schools and years of study

| | N | Technology skill levels | | df | Sig |
|---|---|---|---|---|---|
| | | Mean rank | Chi square | | |
| *School* | | | | | |
| Architecture, Art and Historic Preservation | 13 | 77.46 | | | |
| Arts and Sciences | 65 | 72.95 | | | |
| Business | 31 | 82.02 | | | |
| Education | 17 | 65.82 | | | |
| Engineering, Computing and Construction Management | 12 | 120.50 | | | |
| Justice Studies | 19 | 81.55 | | | |
| | | | 16.199 | 5 | 0.006* |
| *Year of study* | | | | | |
| Freshman | 51 | 61.93 | | | |
| Sophomore | 35 | 78.87 | | | |
| Junior | 30 | 94.23 | | | |
| Senior | 46 | 96.89 | | | |
| | | | 20.366 | 3 | 0.000* |

*Table 7. Relationship Between students' technology usage and their year of study*

| | N | Technology usage | | df | sig |
|---|---|---|---|---|---|
| | | Mean rank | Chi square | | |
| *Year of study* | | | | | |
| Freshman | 52 | 62.28 | | | |
| Sophomore | 36 | 85.64 | | | |
| Junior | 30 | 91.95 | | | |
| Senior | 46 | 96.74 | | | |
| | | | 15.121 | 3 | 0.002* |

80% of the students use Assignments, Gradebook, and Resources options inside the LMS that are set up by their faculty. University provides Gmail and Google Apps for Education for students but not for faculty. Faculty use Microsoft Exchange mail and the Office Suite. This refers back to one of the themes that emerged in the open-ended questions in FPDTEE, which was the inconsistencies in technologies. Nearly half of the students prefer Google Drive (58%) and Social Networking Sites (49%) on their own choice and benefit. Some students have multiple Google accounts for personal and University accounts.

Analysis of technology skills of students showed significant difference among students from different schools ($\chi^2$=16.199, p= 0.006<0.05) in Kruskal Wallis Test (Table 6). The Engineering students reported a high levels of digital technology skills compared to Art and Sciences (p= 0.000<0.05); Business (p= 0.004<0.05); Architecture, Art and Historic Preservation (p= 0.003<0.05); Education (p= 0.000<0.05); and Justice (p= 0.001<0.05) school students who claimed lower levels of technology skills. Technology skills of students also showed significant difference regarding to their years of study ($\chi^2$=20.366, p= 0.000<0.05). The junior and senior students claimed higher technology skills than freshmen and sophomores (Table 6).

There was significant difference between technology usage levels (inside and outside University) and year of study ($\chi^2$=15.121, p= 0.002<0.05) as seen in Table 7. Results of technology skills showed that usage freshmen students' levels inside and outside University were lower than other classes. There was no meaningful difference in student technology usage levels among schools.

In the open-ended section of the survey, students recommended some future technologies to support their educational efforts. One major theme was converging from the answers about mobile friendly environments. In addition; lecture videos, more online and hybrid courses, clickers and interactive review quizzes to improve the attendance and engagement of students were requested. A counter theme also converged from the input data. Students argue that faculty don't utilize all functionalities of the LMS. This suggests that although faculty usage of the LMS was analyzed to be high, it is still lower than students' expectations. Many students requested that faculty use the LMS gradebook efficiently. A few students wanted to be informed and taught about services and resources that University provides. They also favored access to wider variety of e-books. One major theme converging from data input was the digital mode of communication with faculty.

Students suggest to improve the technologies on hand. Commented that University Gmail, Campus Portal, and LMS needs be "combined into one easy-to-access" point or "to integrate technologies together." This is also in-line with the theme discovered over the inconsistencies of technologies.

Other emerged infrastructure related themes were the need for better and easy access to Internet infrastructure and WiFi, faster computers, smartboards, updated software, and "more innovative and advanced classrooms." Also, asked for more access to computers in the library, faster and more reliable connection to cloud-based systems, and virtual desktops.

## Faculty Use of TEL Environments

The most frequently used TEL tools by faculty are listed in Table 2. Nearly the entire faculty respondents (96%) used LMS and more than half of the faculty used Library databases (59%) which are intuitively the same level as students. The next most used technologies are Panopto (45%) a video recording and streaming software, Turnitin anti-plagiarism (42%) and Citrix GoToMeeting/ GoToTraining (40%) for web conferencing. Within the tools provided in Sakai LMS system, some of the most commonly used modules are the Syllabus section, Roster, Assignments, and Resources, which are access around by 80% of faculty. Frequently used tools apart from University provided tools are publisher materials, Google Drive, and e-books.

Technology skills of faculty in different schools showed significant difference ($\chi^2$=15.323, p= 0.032<0.05, see Table 4). Members of the Law faculty had claimed to have low level skills compared to faculty from Art and Sciences (p=0.000, p<0.05), Business (p=0.006, p<0.05), Continuing Studies (p=0.007, p<0.05), Architecture, Art and Historic Preservation (p=0.001, p<0.05), and Engineering, Computing and Construction Management (p=0.004, p<0.05), who claimed a higher level of skill in digital technology. However, there was no significant difference in technology skills between full-time and part-time faculty members. Also, researcher was not able to find a significant impact on technology usage and years of teaching experience, and faculty members attendance to faculty development events.

There was a significant difference in technology usage levels of full-time and part-time faculty members ($\chi^2$=9,922, p=0.002, p<0.05); with higher levels of usage by full-time faculty (Table 5). However, there was no difference in faculty technology usage levels (inside and outside University) between schools, between teaching experiences, and attendance in prior faculty development activities.

In the open-ended section of FPDTEE, faculty mentioned an interest to use several technologies for enhancing their teaching in the future. Some stated their plans to use video conferencing, recording of live sessions and smartboard technology. Their preferences for different teaching and learning method included flipped classroom, blended learning, online learning, experiential learning, short-term study abroad, project-based learning, service learning, collaborative learning, and learning via gaming and simulations. Most of these preferences constitute an overarching theme for the type of technology many faculty wish to add in their pedagogy. Also, most of these technologies require an interactive schema between the learner and the materials, but not necessarily with the educator.

In this section of responses; preference of using several methods such as online portfolios, online guided listening experiences, chat lines, live synchronous workshops and use of video teaching in conjunction with classroom discussion and activities were mentioned. Suggestions for using interactive tools for quizzes, tests, and in-class surveys, such as clickers (physical or virtual via mobile device) are also mentioned as a way to create collaboration, and interaction amongst students, as well as to increase engagement. Also, another thought-provoking remark was the suggestion to come up with alternative ways of communication with students, since "clearly email is not the preferred mode for communication for students." A faculty member said "Creative approaches to learning are key to trying to meet the educational needs of a diverse student body." However, there were a few others who claimed that they were not interested in innovative teaching methods and they felt confident in the traditional methods they were using at present.

This study also gathered data to reflect faculty TEL expectations in future. They proposed changes related to technology infrastructure; such as reliance of internet access, cloud-based technology, and wireless access. Upgrading computers and other technologies inside the classroom also appeared as a theme in the open-ended questions section, which is in alliance with the fast-changing digital technology. It appears that the hardware upgrades need to be up to speed as the software updates. A second theme mentioned was the inconsistencies between university provided technologies and technologies deemed to be common among students. These inconsistencies cause confusion, and loss of focus. A third theme that converged was the inclination of faculty towards more flexible and customizable software templates, such as customizable LMS and smart TEL tools. Elçi, Ertuğrul and Elçi (2016) suggest a learner-centered metadata model that investigates the mechanism of e-learning environments and the ways e-learning processes can be classified based on content semantics for e-learning activity coordination through various LMS processes. Faculty members want to be able to design, create and manage their pages in web spaces provided by the institution. The creation of web pages by faculty and students, integration with digital textbooks, and addition of a collaborative document sharing environments within the current LMS, were also part of future expectations.

## Student and Faculty Cross Analysis

From the results of both surveys it seems that faculty (Mean= 3.41, STD=.88) and students (Mean= 3.56, STD=.88) claimed to have above average required skills and experience in TEL environments. The benefits faculty get from using TEL environments provided by the institution were rated similarly by both faculty and students. *Managing course activities* and *accessibility of the materials* were the top two advantages specified by both groups. *Improving communication* was highly valued by the faculty. In contrast, *saving time* was more frequently selected by students, although faculty generally mentioned "time" as a challenge in setting up TEL environments in both surveys and interviews.

A general concern extracted from data analysis and interviews was acquaintance with available technologies provided by the institute. Many faculty members and a few students complained about not being aware of the available TEL methods, tools and opportunities provided. This is despite the faculty development program, activity invitation announcements and emails organized by the Department of Instructional Design and Technologies. This study also collected data on factors that attract faculty to participate in professional development programs. The top two support systems that faculty claimed to be the most effective were *informal discussion with a colleague* and w*orkshops.* According to survey results 73% of faculty reported that they prefer personal consultation with an expert in order to receive help for TEL.

Similarly, the LMS, Library databases, assignments and electronic resource repositories were the most used TEL tools. Both students and faculty claimed that email was not the preferred mode for communication between themselves. Both asked for a more innovative TEL infrastructure. Besides the hardware, they asked for improved software infrastructure including a better user interface, more flexibility and mobile friendly LMS. There was interest in teaching and learning using online/ hybrid/ flipped/ blended methods. Both groups suggested using mobile devices and clickers for in-class activities for improving the attendance and engagement of students.

Many faculty showed their interest in faculty development activities for TEL. Faculty mentioned that they are excited to use a vast range of TEL methods and technologies. Most of the students, commented that they wanted faculty to increase their LMS utilization. Wide range of students asked for enhancing online and hybrid courses. These results show that; where faculty are aware of their needs to improve the skills and increase the usage, students are willing to use them more if faculty utilizes. There was consistency in realization in the need for more reliable and innovative classroom technology.

The technology skill levels of faculty and students showed significant difference depending on their schools, where Law faculty members claimed low level skills and Engineering students claimed high level skills. Full-time faculty members' technology usage level (inside and outside University) was higher than part-time. Freshmen students had lower technology skills and lower technology usage level than the other years of study. However, this study did not compare the use of TEL among faculty who traditionally teach freshmen versus those who primarily teach upper-class students to see if this might explain the differences and the impact. Both groups suggested the integration of all current TEL environments to a single sign-on, as well as increased access to *cloud-based* platforms. The findings emphasize that there should be sustainable changes in the teaching and learning environments such that the latest technology and innovations can be followed and faculty and students point of views can be focused.

## DISCUSSION

The responses to this study can be clustered in three dimensions: institutional, faculty focused and students focused. In **institutional dimension,** responsibilities are mainly related to the transform of technological infrastructure to make it more innovative, fast, and dynamic to support TEL tools and methods. In addition to investment, the institution is also expected to provide resources for development and support of faculty and students on digital learning technologies for maximum utilization and success. Faculty and students provided valuable feedback on their preferred methods for this support. Students mentioned more mobile friendly environments, online and hybrid courses. Literature emphasizes on the importance of support to students: for technological problems, individualized improvement of academic performance, quality of TEL (Casanova et al., 2011; Natow et al., 2017; Poon, 2013). Faculty asked for opportunities for informal communications with and workshops from colleagues. The need to support faculty is further emphasized (Bilgiç et al., 2011) by quoting "it is important to consider the support in place for these users to overcome barriers of time, skill sets and confidence in order for successful implementation" (Reed, 2014). The support mentioned by faculty is preferred not to be one-size-fits-all type of support, since faculty varied needs as adults should be taken care of with individualized group or one-to-one programs.

Findings suggest that there exist consistent concerns among groups in our study. The first major one converging from data analysis, and supported by interviews, was the need for a *uniform platform* that supports learning tools, communications, required software for different disciplines, and collaborative data sharing schemes. This objective relates to discrepancies in tools used by students and common among faculty, or offered by the institution, and differences in the tools required by different disciplines. These differences would only magnify the discrepancies and the difficulty in offering a uniform platform. Even you know it, it may not be easy to cater different needs of different stakeholders, starting from the financial side for the institution. For example, tools and technologies common among graphic design students or faculty are vastly different than technologies used by students or faculty in business school. In addition, many tools used common among students in communication, or collaborative file sharing, differ from tools common among faculty and tools by main source of funding to the adoption and enforcement by the institution.

A second theme that was determined based on findings, was the *frequency and consistency of updates* in software and hardware. Institutions, evidently, are not keen on frequent infrastructural changes. For example, computers, servers, and Wi-Fi structure requires major capital investments and longer time durations for updates.

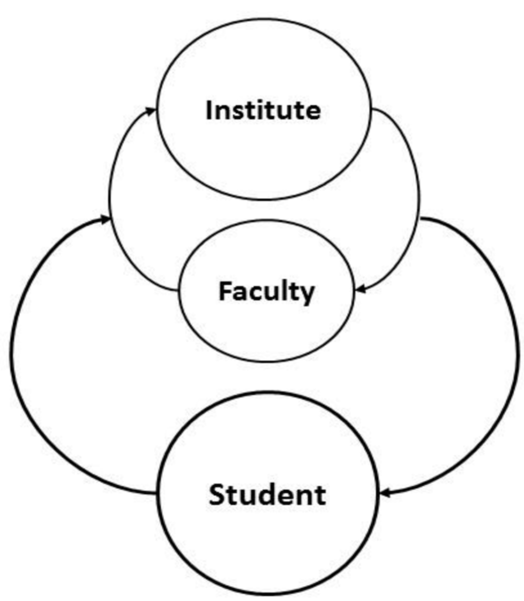
In addition to the institutional changes, the second dimension of our study involves the faculty members' responsibility to dynamically update their teaching methods and pedagogy using TEL environments for more active and engaged learning and improved communication and interaction with their students. Hands-on workshops can be organized where a colleague from the same discipline can facilitate the faculty development accompanied by a person from the Department of Instructional Design and Technologies.

As the third dimension, and maybe the most important factor for constitution of a dynamic and productive system, students and their utilization of all TEL environments that the institution provides; identifies the positive or negative impact of TEL on the institutional learning outcomes.

Researchers are depicting this three-dimensional system in Figure 1, where faculty and institution identify the best setup to achieve their learning outcomes, deliver this system to their student body, and student body will provide a feedback for system adjustments. In parallel to this, Casanova et al. (2011) suggests Teaching, Learning and Assessment (TLA) strategies and practices which teachers and students develop when using TEL environments. Also, Lai et al. (2012) emphasize the importance of student and faculty interaction and support.

The results of this study show that there is a difference in expectations for the future. The **students** want more faculty to utilize technology and create effective TEL environments, as faculty require additional support for TEL. Hence, there is a need to come up with solutions to close the gap as the new

*Figure 1. System Dynamics for TEL Development*



generation of millennials enter higher education. There is a need for embedding faculty development in TEL into new faculty orientation to prepare educators for the incoming students. McQuiggan (2007) comments that faculty experience and skills as adults should be considered, and Randall (2008) comments that the need to create learning communities should not be underestimated as a professional development approach.

When the findings in this study are compared to Allen and Seaman's (2012) results, there are some similarities. Students are in favor of using social networks for communication and educators are more likely to use the LMS, which is supported by our findings. In addition, the difference between schools in technological skills and technology usage level has to be considered when giving training or providing TEL environment. The change in roles of the students, faculty and institution in higher education will affect the quality in higher education.

## SOLUTIONS AND RECOMMENDATIONS

Introducing a uniform platform that supports a variety of resources and tools would be the upcoming challenge for the information technology and information management systems. This can be overridden by using cloud-based solutions. E-learning architecture based on cloud computing has many advantages over traditional e-learning (Riahi, 2015). Some of the recommended cloud-based solutions among the most popular used ones in education are Google Apps for Work is cloud computing efficiency, communication and collaboration system tools and software and MoodleCloud is the cloud-hosted solution for e-learning environment.

Since software and requirements for computing capabilities are accelerating at a very fast speed. Institutions will face this challenge in the coming years as to how frequently, and how efficiently they are required to update the technological infastructure to keep up with the ever increasing changes.

A preferred mode of faculty technology development program is to use story telling or demonstrations by colleagues who are using innovative TEL environments. "Asking teachers to share their stories and to reflect on their technology integration experiences, is one potential method for highlighting the possibilities of technology, while positively shaping teachers' personal beliefs about those benefits." (Ertmer, Ottenbreit-Leftwich, & York, 2006-2007).

Our findings suggest that most of the students and faculty have not different expectations for future. Where faculty emphasis for the future revolves around the use of TEL for pedagogy, the students focused more on the technology itself. The positive side is that they are both open to innovative environments. As theme three suggests, faculty are both looking for a customizable LMS that is more user-friendly, that integrates all required tools and that provides a better mobile device experience.

Since both faculty and students express a lack of awareness of the technologies provided by the institution, they are expecting improved communication and information delivery on such tools. They are both interested in more interactive and engaging teaching and learning environments. However, most of the students are more concerned about improving and integrating existing TEL infrastructure.

## FUTURE RESEARCH DIRECTIONS

This study investigated students and faculty perceptions. An inquiry to get the institutional perspectives of challenges in implementing TEL environments can be done to provide a cross analysis between the students, faculty and institution. Also investigating the steps to build student-faculty-institution interaction for identifying the methods and tools can be explored.

## CONCLUSION

This research addresses the upcoming challenges and future gaps between students, faculty, and institutions in the ever-increasing digital teaching and learning. The results from the faculty and student surveys; interviews with faculty and administrative experts; and research activities provided a comprehensive look at the faculty and student perceptions of technology skills, usage level and professional development programs offered at the institution under investigation. Our findings supported by analysis of data emerged to themes and improvement schemes that can be incorporated into future planning for professional development activities to enhance TEL. There are challenges in adaptation of learning environments (both virtual and physical), infrastructure and new tools.

"This strategy recommends that the institutions 'build on foundations' acquired over the last decade, promote a culture of innovation in digital teaching and learning, and implement platforms, resources and technologies such as learning analytics. This strategy along with quality blended module design and development will support staff and students in the acquisition of digital literacy and skills which will change culture and bring about the innovation needed." Logan-Phelan (2018).

The model showed that challenges have three dimensions: institutional, faculty, and students. Institutional challenges emerged into two main themes: Requirement for a uniform platform for TEL and closing the gap in frequency of hardware and software updates. Rapid and innovative change needs cooperation, collaboration and communication between the institution, faculty, and students based on technology infrastructure. In this transition, the technological skills and usage among different schools need to be considered. The differences in disciplines are important to provide the suitable environment to "who needs what" so that the changes can be made successfully and effectively.

TEL is shaping the future of teaching and learning in higher education. Faculty will increasingly be asked to utilize TEL environments to enhance student learning and prepare students for the future. Especially recent "digital learning" and "personalized learning" are major approaches to refer to wide range of services, tools and curricular models designed to create individualized learning for students. Thoughtful planned, targeted to the aim and responsive professional development programs for faculty must take into consideration the needs and perceptions of both faculty and students. So that strength of faculty professional developments can be evaluated by its impact on student success. We complement our findings by referring to Dahlstrom (2015) findings, where he strongly emphasizes that if higher education institutions want to integrate TEL to their courses and use technology effectively, they should bring the expectations of faculty and students in line with the institutional infrastructure. "Universities that are not equipping themselves to adapt to this new digital era will be left behind." (PwC, 2018).

Also as a result of changing roles the pedagogical methods and technological tools used in digital teaching and learning process should not be a sole decision of the institution, but as a result of a collaborative mindset of institution, faculty and students. Even further eversion can be considered for decision making hierarchy, where the requests can be seeded from the students and filtered through faculty members and finalized by the institution.

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## KEY TERMS AND DEFINITIONS

**Digital Learning Models:** Digital learning is engaging, student-centered, often collaborative, and can increase student achievement. Some digital learning theories and models are RAT, TPaCK, Connectivism, ADDIE, and OCL.

**Digital Teaching and Learning:** Digital learning is any type of innovative learning that is accompanied by technology or by instructional practice that makes effective use of technology which encompasses the application of a wide spectrum of practices such as blended and virtual learning.

**Faculty Development:** Faculty development is the process of providing professional development training and coaching to faculty members to help them improve their work performance, particularly in specific areas such as teaching and research.

**Technology-Enhanced Learning:** Technology-enhanced learning (TEL) describes the application of technology to teaching and learning process which causes transformation and enrichment of learning environments.

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